Everyday-Oriented Innovation

Towards a methodological framework for exploring and mapping radical innovation opportunities within everyday activities.

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ABSTRACT

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Towards a methodological framework for exploring and mapping radical innovation opportunities within everyday activities.

The exploration of radical innovation has long been regarded as fundamental to business growth. In the 21st century, modern organisations increasingly seek to combine business innovation with the broader goal to confront social and environmental challenges. Vision projects are a related phenomenon which explore and map radical innovation opportunities within everyday activities. The aim of a vision project is to produce an innovation map that can empower an organisation to navigate between potential innovation opportunities and pro-actively confront modern challenges for the benefit of people, business, and society.

The study seeks to improve the innovation map's qualities as a navigational instrument by modelling a methodological framework for vision projects. It was conducted as a series of four research cycles which modelled and experimented with different methodological approaches. The modelling was based on desktop research of theory and methods, and the methodological approaches were tested in experiments with participation of students from DTU and TU Delft. Gradually, the study built up an understanding of how different types of methodological measures can improve the navigational qualities of innovation maps.

The study finds that a new body of knowledge, developed around practice theory from the field of sociology, can effectively uncover the fundamental conditions which shape everyday activities and, thereby, significantly improve the navigational qualities of innovation maps. The findings document the importance of constructing a framework on the basis of reflections about the worldviews that are propagated by different framework elements, such as methods and techniques. In the context of vision projects, the study further specifies the potential of sociological perspectives on reality as an alternative to the rational systems theoretical perspectives, that are the dominant foundation for innovation methods today.

Finally, the study presents the main elements of a new methodological framework based on a practice-oriented approach and discusses its implications in a wider context.

ABSTRAKT (IN DANISH)

Hverdags-Orienteret Innovation

Et bidrag til en metodisk ramme for udforskning og kortlægning af radikale innovationsmuligheder indenfor hverdagsaktiviteter.

Udforskning af radikal innovation er længe blevet betragtet som grundlæggende for virksomheders vækst. I det 21nde århundrede ser man i stigende grad, at moderne organisationer søger at kombinere forretningsudvikling med et overordnet mål om at konfrontere sociale og miljømæssige udfordringer. Visionsprojekter er et relateret fænomen, som udforsker og kortlægger radikale innovationsmuligheder indenfor hverdagsaktiviteter. Målet med visionsprojekter er at udarbejde et innovationskort, som gør organisationer i stand til at navigere mellem potentielle innovationsmuligheder og proaktivt konfrontere moderne udfordringer til gavn for borgere, virksomheder og samfund.

Studiet har til hensigt at gøre innovationskort til bedre navigationsinstrumenter ved at modellere en metodisk ramme for visions-projekter. På baggrund af litteraturstudier af teori og metoder blev nye metodiske tilgangsvinkler modelleret og efterfølgende afprøvet i eksperimenter med studerende fra DTU og TU Delft. I løbet af fire forskningsforløb blev der opbygget en forståelse af, hvorledes forskellige typer af metodiske tiltag kan forbedre innovationskortets kvaliteter som et navigationsinstrument.

Forskningen fastslår at relativ ny viden indenfor det sociologisk felt 'praksis teori' effektivt kan afdække de underliggende forhold som forårsager ændringer i hverdagsaktiviteter og dermed væsentlig forbedre innovationskortets kvaliteter som et navigationsinstrument. Resultatet vidner om betydningen af at konstruere metodiske rammer under hensynstagen til de verdenssyn som kommer til udtryk gennem forskellige metoder og teknikker. I forhold til hverdags-orienteret innovation fremhæves mere specifikt de sociologiske perspektivers potentiale som alternativ til de rationelle system teoretiske perspektiver, som innovationsmetoder traditionelt bygger på.

Som afslutning på studiet præsenteres hovedelementerne af en ny metodisk ramme med udgangspunkt i praksis teori.

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PREFACE

This thesis is the result of my journey into the academic realm of radical innovation and vision building. The endeavour was primarily motivated by my own experiences as a concept developer and innovation manager in industry, where I learned that methodology for radical innovation was inadequate and inconsistent. As a result, projects often turned into creative exercises, rather than thorough investigations of possible alternatives. The lack of a proper foundation also meant that it was difficult to manage and exploit the abundance of creative ideas developed over the years. Individual concepts and visions could be very inspiring, and were often enthusiastically received by top management, but they did not provide the level of insight that was needed for supporting risky and ambitious innovation. In consequence, the ideas were seldom brought to fruition.

Nevertheless, I also learned that design thinking has a great potential to generate practical solutions for complex situations and to reconcile opposing views, because designers are able to pragmatically make use of powerful methodology from other fields of study and have an outstanding empathy with people and the everyday context. Together these capabilities have a great potential to meet modern challenges and create value for people, businesses, and society. It is therefore important to advance the field of design thinking. Especially, at the time of writing because we are in the favourable situation that policy-makers and decision-makers are open to new ways of solving modern challenges.

Initially the study was entitled, “Foresight for Innovators”, because I assumed that future studies held the key to exploring deep change in everyday activities. However, during the research it became clear that the studies of the future are in general biased towards analysis of technology and do not encompass the social and value-oriented changes within everyday activities, targeted by this research. A reference to the future in the title was therefore found to be potentially misleading. The term 'radical innovation' has also been considered for the title, but to escape the confusion that surrounds the nature of radical innovation, I chose the title, “Everyday-Oriented Innovation,” which is both more informative about the subject of innovation and indicates that the aim is to fundamentally change our social reality.

In this study, it has been my intention to be as open as possible to learning about everyday-oriented innovation. I hope thereby to have made a first step towards defining and developing the emerging field which can inspire further research and practice.

ACKNOWLEDGEMENT

This PhD project was undertaken at the Department of Management Engineering at the Technical University of Denmark (DTU) from 2005 to 2010. The research was funded by DTU.

The study was an opportunity for the author to relate his professional experience to an in-depth, academic investigation of radical innovation. My shift from industry to scholarship has been a very positive experience because of the many helpful academic colleagues that have taken interest in my research. I would like to give special thanks to the following people who have supported this research endeavour.

I thank my supervisor, Torben Lenau, for supporting the research project from the beginning to the very end. His encouragements and patience has helped me in difficult times. Moreover he offered me the freedom to shape the research into its present form. I also want to thank my co-supervisor, Ulrik Jørgensen, for introducing me to the depths of scientific knowledge.

At the Studiolab of the Technical University of Delft, I would like to thank Pieter Jan Stappers, for inviting me as a visiting scholar. I truly enjoyed my time with the fun and inspiring colleagues at the Studiolab. It also provided me the opportunity to collaborate with Remko van der Lugt, who opened my eyes to the world of infographics.

More than 200 students have participated in the experiments and courageously submitted themselves to the methodological frameworks that I modelled. I thank them all for their positive attitudes and valuable comments. The participation of the music festival, “Roskilde Festival,” in the final experiment was also much appreciated. It was definitely one of the highlights of the study to do ethnographic research at the festival site, with mud to the knees together with my colleague Hanne Lindegaard.

Finally, I will thank my family and friends who have given moral support, collected newspaper clippings and proof read text. I dedicate this thesis to Nanna, who initially inspired me to explore my academic capabilities and has wholeheartedly supported me in the pursuit of my dreams.

Copenhagen, August 2010

1 INTRODUCTION

This chapter explains the motivation for the study and presents the research objective, questions, scope and assumptions. Furthermore, it outlines the activities and deliverables of the pre-study which laid the foundation for the research and is described in the following part, “The Stage.”

1.1 THEME AND MOTIVATION

This study is motivated by recent developments in the field of radical innovation. An increasing number of organisations is engaged in radical innovation and popular media presents a steady stream of exciting new radical concepts which promise to change our lives and the world around us. On any day of the week you can read about an exhibition on sustainable architecture for mega-cities, a vision for a future library developed by design students, or an award given to a smokeless wood stove for developing countries.

In the field of radical innovation we also encounter pioneering companies like Philips and Siemens that have persistently explored radical concepts for more than a decade, and have committed vast resources to such projects, even though there is no immediate bottom line pay off. Their visionary work takes place in the intersection between innovation, foresight, design, and social action, but is not fully encompassed by any of these terms. In this study we will therefore designate the term 'vision project' to this emerging phenomenon. The characteristics of vision projects are further elaborated in the following sections.

Sustainable innovation

The exploration of radical innovation has long been regarded as fundamental to the growth of businesses. Over the past decades, competition has steadily increased such that businesses cannot rely on short-term incremental innovation. They must instead pro-actively develop new markets and pursue radical innovation. The exploration of new opportunities is therefore no longer bound by an organisation's strategic goals, resources, or other restrictions in the first stages of business creation - also commonly known as the 'fuzzy front end' of innovation. If a promising innovation opportunity in the subsequent stages of the innovation process fails to match the client organisation, then the idea is simply sold or turned into a separate business unit.

The need for radical innovation in industry has in recent years been supplemented with a broader intent in society to confront social and environmental challenges. It is now common for government institutions, NGOs, and local communities to join forces with industry to create new solutions that provide new value to people, business and society. The new movement is motivated by the concern that the modern, industrialized world is facing grave environmental and social problems. Pollution is widespread. The social sector does not meet the challenges in health care, child care, isolation of elderly people, public education, or inner city crime. The climate is changing due to human activity, and may soon pass a critical tipping point with unknown consequences. We only know for certain that the majority of the world's population that lives in poverty will be further impoverished by climate

change. At the same time, billions of people in India and China, who are trying to work their way out of poverty, demand the resource-intensive lifestyle that has been practised in the industrialized countries for decades.

These modern challenges have changed the questions that innovation addresses. Profit and consumer satisfaction remain important, but they are framed within a larger picture. Here are a few concrete examples of the new type of questions:

- How can we make a flexible, attractive and environmentally-sound transport system for commuters?
- How do we reduce household waste?
- How do we empower local communities to improve safety in urban neighbourhoods?
- How can mobile phones bring value to rural populations in developing countries?

Textbox 1.1: Definition of vision project

A vision project is a type of innovation project which:

- explores and maps radical innovation opportunities within an everyday context.
- thoroughly analyses change and continuity in the world.
- presents a spectrum of visionary futures or alternative situations.
- is motivated by the ambition to transform the world according to values that benefit people, business, and society.

Everyday activities

Envisioning and changing everyday activities, such as cooking, commuting, bathing, and socializing, are key to meeting the modern challenges of society and business. These activities are the bulk of human activity for the majority of the population and are responsible for a large proportion of natural resource consumption and pollution on a global scale. It follows that the accumulated impact of people's everyday activities is all-important for environmental sustainability. Everyday activities also have fundamental impact on people's perceived quality of life, by either empowering or impeding ways of living and social relations. For businesses, an understanding of everyday activities is important, because they shape markets and offer insight into how to offer valuable products, services, or experiences which create a unique relationship with the customer.

Figure 1.1: Everyday activities are the key to creating value for people, businesses and society.

It follows, that ambitions to provide new levels of value, i.e. radical innovation, can be achieved either by supporting existing everyday activities or

enabling fundamentally new activities. An understanding of change and continuity in the everyday is therefore a prerequisite for exploring highly relevant and valuable innovation opportunities in a modern society.

Design thinking

In earlier times, innovation was mainly guided by top-down policy- and strategy-making. In contrast, a vision project employs a bottom-up approach, based on design thinking, in which concrete and contextual elements are the driving forces of the process (Munnecke & van der Lugt 2006). The project team is typically multi-disciplinary and led by designers that pragmatically integrate insights across a wide spectrum. This formula has proven successful in producing highly creative visions and proposals that transcend the conventional frames of solutions (Brown 2008).

The power of design thinking comes from the designers' pragmatic and solution-oriented way of working (Cross 1982). They comfortably integrate technical, social, economical, and emotional aspects into a greater picture, and deploy an efficient, learning-by-doing approach to effectively conceptualize and give form to radical innovations. Some of the designers' most important skills are their creativity, imagination, and ability to think laterally and holistically. Another important skill of the designer is visualization, which makes it possible to capture ideas, concepts, scenarios, and visions in a visual format that is easy to understand and communicate throughout an organization. Such visuals fertilise dialogue across disciplinary boundaries in the organisation and can act as a common language across different divisions.

Figure 1.2: Radical innovation may change everyday activities and thereby address modern challenges.

Last but not least, designers are exceptional at observing and empathising with people. In the past decades, designers have incorporated many ethnographic methods into their toolbox, so that they now have a unique capability to understand the complex interplay between products, people, and the everyday context - which is all-important for changing everyday activities and addressing modern challenges.

The present moment is crucial in the history of design. Only recently has design thinking been given a prominent role in solving modern challenges. However, the trust and hope that is being put on the shoulders of designers is no easy burden to lift. If modern challenges are to be solved by design thinking, then the quality of the proposals must match the potential consequences. Leading design researchers question whether design can step up to the mark (Cooper 2006; Hands 2009), especially as stakes rise due to the emergence of complex global and environmental issues which leave no room for learning by trial and error.

If design thinking does not step up to the mark, trust in design thinking may be quickly withdrawn. This would be an unfortunate development, because design thinking has great potential to deal with modern challenges and create long-term sustainable value for people, business, and society at large. It

is therefore the intention of this study to support and advance the development of the field of vision projects.

Current situation

At the present moment, vision projects are an emerging phenomenon. There is no established convention about the role of vision projects or how the outcome is to be used in an organisation. The outcome takes all kinds of formats, from simple prototypes to elaborate reports. Likewise, there is no established methodological framework for vision projects. The field flourishes with a variety of idiosyncratic methods and generic process models imported from innovation, design, business, and future studies (Arbnor & Bjerke 1997; Love 2000). In addition, many techniques and tools are brought in from exotic disciplines. It is a highly productive methodological field, nevertheless there is little progression in the build up of knowledge. New methods are modelled without a reflection on previously tested methods and uncritically incorporate techniques and tools, constructed for other purposes, from other areas of research and practice.

> *"The current swirl of diversity could signal a return to the days of ad hoc systems development, lack of formal methodology, and consequent increase in failure." (Avison & Fitzgerald 2003, p.79)*

The issue

The lack of coordinated efforts to develop the field of vision projects poses a serious threat to the future of the phenomenon if the outcomes fail to live up to the expectations and requirements of the client organisations. Radical innovation involves large investments and high risk, so it is all-important that vision projects are executed in a controlled manner and provide a well-founded overview of innovation opportunities, including insight into underlying dependencies and pitfalls. Unfortunately there is a high variation in the effectiveness of vision projects. Inconsistent methods and techniques do not easily integrate, and result in frustrating experiences for the team members and prolonged project durations.

Another problem is the quality of the outcome. At first glance, vision projects present intriguing visions and proposals. But after closer inspection, they often reveal a lack of insight and depth, so the visions and innovation proposals stand out as fragmented and superficial. This kind of outcome may be suitable for marketing, but it does not qualify as a foundation for deciding the future of an organisation. In the worst case, a vision project can mislead rather than enlighten a serious dialogue. In the long run, a poorly formulated vision project can disappoint stakeholders irrevocably, so they will refrain from future participation in visioning projects, thereby damaging the reputation of the entire field. It is therefore critical to make the outcome more *navigational,* so that it can function as kind of *innovation map* which supports an organisation's orientation in relation to its environment.

The potential

A methodology for vision projects may take inspiration from many places. Vision projects share many commonalities with design, business, innovation, and foresight projects. These fields of applied research contain a wide variety of methodologies and incorporate many types of theories which could potentially benefit the field of vision projects. So far there have not been any dedicated attempts to search and identify methods and theories relevant for vision projects.

In the field of user-oriented design, methods and theories from sociology and ethnography have been incorporated, revealing design thinking's

unique capability to sample methods and theory pragmatically into effective methodological frameworks. However, in the case of vision projects and sustainable innovation, the object of investigation includes the wider context of the everyday, so there is a need for dedicated study into how to integrate promising methods and theory from other areas of research for that particular purpose.

1.2 OBJECTIVE AND FRAMING

Objective

This study is motivated by the observation that the current trend-based methodological approach for vision projects results in an innovation map which is superficial and fragmented. The main hypothesis is that existing theory and methodology from other fields of study may improve the navigational characteristics significantly, if they are integrated into a methodological framework in a fitting and pragmatic way.

The overall aim is to provide organisations with a better understanding of how to explore and map radical innovation opportunities. In addition, the study aims to make a contribution with new knowledge about the methodology of vision projects taking place in the intersection of design, innovation, business, and foresight studies. The research will more specifically provide insight into how different types of methodological measures affect the qualities of the outcome, so that a better methodological approach can be recommended and integrated into an overall framework for vision projects. It follows that the research objectives are:

OB1: ... to establish a conceptual understanding of how different types of methodological measures affect the navigational qualities of an innovation map.

OB2: ... to propose a methodological approach and integrate it into an overall framework for vision projects.

Research questions

The research endeavour is guided by two research questions which together lead towards the fulfilment of the objectives.

RQ1: What is the issue which causes an unsatisfactory innovation map and which type of methodological approach can most significantly improve the quality of an innovation map?

The first question seeks to understand the relationship between the characteristics of the outcome and the methodology. In between the methodology and outcome there are several intermediate aspects which must be understood in order to answer this question. Furthermore, we need to explore different types of approaches and learn about their effects. In the field of design it is common to study methodology, but this research distinguishes itself by the pursuit of relatively abstract qualities and a conceptually open exploration of different types of methodological approaches.

RQ2: How can a new methodological approach for vision projects be constructed and integrated into an overall framework so that it is applicable within the project context?

The second question is of a more practical nature. It concerns the creation of a concrete theoretical foundation on which an effective and efficient

framework can be constructed. The translation of theoretical concepts into practical tools for professionals is seldom straightforward and requires deep insight into the skills and resources available for the project.

Challenges
The main challenge of this study is to explore the potential for significantly improving the navigational characteristics of the innovation map by integrating new theory and methodology into a framework for vision projects in a designerly and pragmatic manner. Since we are not merely looking to incrementally improve current methodology, but seeking significant improvement, an essential part of this challenge is to search for and identify promising new theory and methodology.

Furthermore, the making of an innovation map is a complex conceptual and social process, so there is no final truth. The result of the study is more likely to be an understanding of the potential of different methodological initiatives, balanced by an appropriate awareness of a number of interrelated - and often conflicting - factors and issues.

Practical relevance and academic rigour.
The main intention of this study is to produce knowledge that is relevant to the field of practice, i.e. the innovation teams performing vision projects and the organizations that employ them. The concept of relevance naturally demands that the knowledge is effective with regard to the practitioners achieving their desired objectives, but it should also be fitting for the project context, i.e. the multi-disciplinary, design-led environment of a vision project. This study is particularly aimed at exploiting the power of pragmatic, designerly ways of working, so the fitness of methodology in the project setting is a central aspect of the research assignment. In consequence, the study must be grounded in a thorough analysis of the professional context.

Although the research primarily arises from a particular context of application, and does not take its starting point from any particular academic discipline, the methodology should also be developed with appropriate scholarly rigour to make a contribution to the academic body of knowledge. It is herein important to note that the purpose is not to produce new scientific theory, but rather that the methodological framework may be inspired by, and grounded in, scientific theory. The intention to produce relevant, yet rigorous, research is a typical dilemma in applied research (Argyris et al. 1985; Pettigrew 1997; van Aken 2004). How this dilemma affects the set-up of the study will be investigated in chapter 9, “Research Approach”.

Object and professional scope

The object of this study is the methodological framework that is used by innovation teams in the context of vision projects. The framework is a management tool which structures project activities with regard to unfolding and manipulation of an innovation space. Later in the thesis we will go into detail about the professional context of vision projects and the desired qualities of the innovation map, so in the following the starting point of the research is only briefly outlined.

Organisational context
This study is relevant to organisations that seek to be innovative in the consumer market. Typically organisations are forced to be innovative due to competition and the desire to be market leaders. Public or civic organizations that pursue specific values may also partner with private companies. These organisations seek radical innovation that can re-frame markets and therefore put many resources into the fuzzy front end of innovation.

Modern challenges
The purpose of vision projects is not only to create long-term profit for companies. They also aim to create value for a broader spectrum of stakeholders, encompassing local communities, minorities, private business, civic government, public institutions, and organisations. The identification of the values shared by all stakeholders is therefore a critical aspect of the vision project, and also a very complex endeavour which involves philosophical reflections. In order to reduce the complexity, the study will therefore assume certain commonly accepted values, such as quality of life and social innovation, and use them as a starting point to investigate general methods for integrating values into the development of alternative innovation opportunities.

Innovation map
The outcome is clearly defined as everyday visions and radical innovation opportunities. The two elements are considered to be two sides of the same coin, because one needs a concrete proposal to convey the idea and value of a vision, but one also needs an overall vision to give meaning to a concrete proposal. Typically, the outcome includes all of the content that is developed throughout the project to motivate, support, and communicate the everyday visions, i.e. trends, insights, scenarios, innovation proposals, etc. But in this research project a critical view is taken towards existing ways of producing and communicating content, so no preliminary assumptions are made.

Project context
The framework must be compatible with the innovation team's designerly ways of working and the typical project set-up. It is assumed that the multi-disciplinary, solution-driven process, and its ability to integrate knowledge from a broad spectrum of perspectives, has the greatest potential to produce compelling everyday visions and radical innovation opportunities.

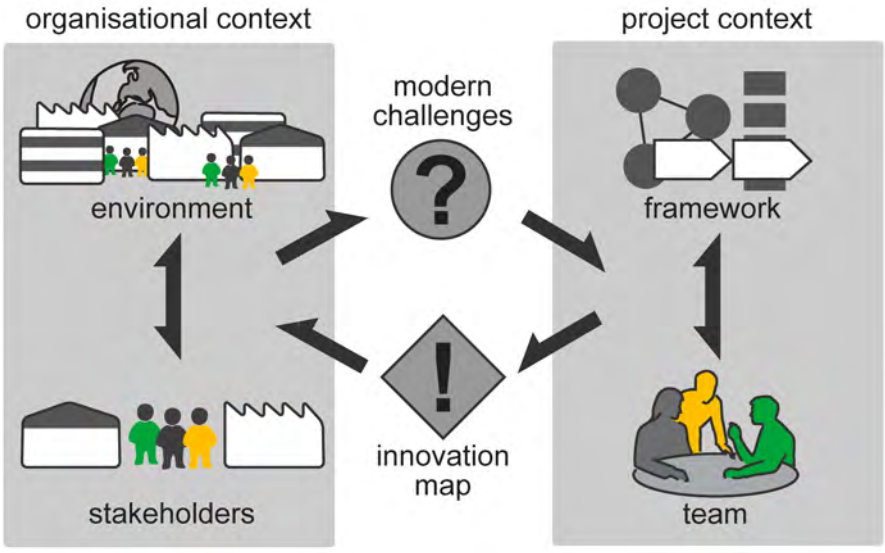

Figure 1.3: An overview of the professional context that surrounds the methodological framework.

Delimitation of methodology

The methodological framework should assist the innovation team through all phases of a vision project with regard to management of the innovative content. It starts with the framing of the project and finishes with the presentation of an innovation map. The subsequent phases, in which the innovation map is integrated into the overall organisational process, and

inspires concrete strategies and actions in the company, is not included in the framework. In other words, we only consider the fuzzy front end of innovation.

A single vision project provides an overview of a specific subject area, so it is likely that an organisation will conduct several vision projects in parallel or serial to explore different areas of innovation opportunities. In this way individual innovation maps can form part of a greater organisational knowledge base which accumulates insights and frames each vision project within a larger picture. Careful management of the knowledge base is also important to assure an efficient build up and use of insights over time, but that aspect will not be considered in this study.

General assumptions

The study is based on three central assumptions which are common for modelling of methodologies in the field of design and innovation:

AS1: New solutions are needed to solve modern challenges.

Knowing the solution is not always the same as solving the problem. First the solution must be communicated, accepted, and implemented by all involved parties. In modern challenges, both private and public interests are at stake, so it may turn out to be a complicated process to engage all parties, reach a consensus, and mobilize the necessary momentum to implement change. It is therefore possible that the solutions to modern challenges have already been presented, but that there is not yet the necessary momentum to see them through. Nevertheless, in this study we will measure the success of a methodological approach by the quality of the outcome, and not experiment with the consensus making aspect of vision projects.

AS2: Organisations are rational entities that purposefully pursue innovation opportunities.

The outcome of the vision project - the innovation map - serves as a tool for guiding an organisation's innovation strategies and activities. However, it is built on an assumption of perfect communication and sharing of the knowledge, as well as the condition that the stakeholders are rational individuals. In practise, the outcome may be interpreted in different ways according to the stakeholders' frames of reference, and often there are covert power struggles taking place.

AS3: A methodological framework structures an innovation team's activities.

The methodological framework is just one of several factors that affect the process of a project. For example, the size and skills of a team have an all-important impact on that team's ability to use a framework and to reach a conclusion within the time available. Research also shows that the physical setting, the innovation culture, the organisational setting, and roles of different actors may affect the outcome (Darsø 2001; Lerdahl 2001; Friis 2004). This study seeks to define and freeze all other elements of the project context besides the methodological framework, so that the effect on the outcome is as transparent as possible.

Another issue is that teams do not act according to prescriptions, but often improvise as a project moves ahead (Schön 1983). Designing is often con-

sidered a skill that is acquired through 'learning by doing,' and not conveyed by formulas. On the other hand, several studies have shown that a structured project process increases the success of design and innovation projects.

> *"In large-scale and complex design processes one just has to organize and plan explicitly the design operations." (van Aken 2005, p.401)*

This study will seek a middle road, in which the framework provides an understanding and insight, and that also allows room for improvisation.

1.3 PRE-STUDY

Before starting to model a methodological framework, it is necessary to define a suitable foundation - or stage - which can support a purposeful and effective modelling process. A pre-study will therefore set the stage by defining the professional and academic context. Once the context is defined, it is possible to infer the challenges involved in modelling a methodology for vision projects. Therefore, the presentation of the research approach is reserved for a subsequent chapter (see chapter 9, "Research Approach").

Deliverables

The intention of the pre-study is not to develop new knowledge, but to investigate the current knowledge and present a clearly defined foundation for the modelling. However, because vision projects are an emerging phenomenon, it may be difficult to define a sufficiently coherent picture of the context. Consequently, we may have to construct and envision a proposal of what the context could be, rather than what it actually is.

Companies achieving competitive separation
will be focused on 'next practices,' not best practices
- C.K. Prahalad, World Innovation Forum 2009

Professional context
The immediate goal of the investigation of the professional context is to create a frame of reference for defining the effectiveness and fitness of a new methodology.

It has already been stated that the innovation map should be *navigational*, but we must analyse the role of vision projects in a modern organisational context to obtain a more detailed, operational description of 'effectiveness', which can guide the modelling of a new methodology. Herein, it is useful to create a distinct conceptualisation of the outcome as an innovation map, and against this background identify the desired qualities that can elaborate our understanding of being navigational.

In order to create an understanding of the term 'fitness' we must investigate how vision projects are typically set up and practised. More specifically, it is useful to define the time available, the number of team members, their skills, etc., so that the modelled methodological framework is applicable within the typical project context.

Academic context
In order to make a significant contribution to existing academic knowledge it is crucial that the study build on existing methodologies and extend them with an appropriate level of scholarly rigour. The modelling of a methodological framework is not new in an academic context, so previous research on the subject can help determine the conceptual elements and structure of a framework. Such conceptual understanding may be helpful in modelling

new methodological approaches in a structured manner with references to existing research.

The development of a new framework does not have to start from scratch. A wide variety of methods share many of the same characteristics of a vision project in design, innovation, business, and foresight studies. To avoid 're-inventing the wheel', an initial review of these methods may reveal some commonly accepted traits which may make it relatively straightforward to model a basic overall process for a vision project. The basic process can then function as a support for focussing on more specific methodological issues, with an even greater capacity to improve the desired qualities of the outcome.

As a spin-off, the review of existing methods may also result in a collection of alternative methods to inspire the modelling of a new approach.

Core investigations

As previously stated, vision projects are an emerging phenomenon with reference to many fields of practice and research, so it was natural to try initially to achieve an overview of all the different individuals, organisations, university programs, journals, magazines, websites, etc., that one way or another touch upon the theme. A number of interviews with leading academics and practitioners in the field further elaborated the information. An analysis of the material resulted in a *community map* which defines nine distinct communities. The community map was elaborated continuously throughout the study and provides a point of reference for the two following investigations, which serve to create more specific overviews:

- **Survey of radical concepts:** a collection of radical concepts and visions presented by designers, architects, and other visionaries. The emphasis is on contemporary works from leading organisations, but also tracks the evolution of the theme from the start of the industrial revolution.
- **Survey of methods:** a collection of theories, methods, models, and concepts which, in one way or another, concern radical innovation. In particular, design, business, innovation, and foresight studies have been investigated.

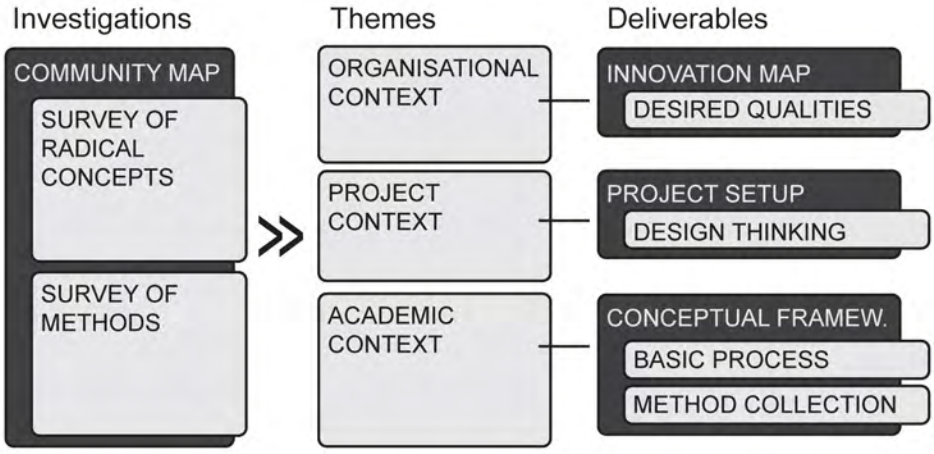

Figure 1.4: Overview of pre-study.

Sources of information

The pre-study does not claim to be a scholarly study, and should not be evaluated as such. Nevertheless, much effort has been put into using a variety of research methods to make it as well-founded as possible.

Academic and popular sources of information have been thoroughly searched on the internet and libraries by means of desk research. Leading researchers and practitioners in the fuzzy front end have been interviewed, and the researcher has participated as either assistant or consultant in several vision projects to gain inside knowledge of contemporary practice.

1.4 OUTLINE OF THESIS

This thesis is divided into four main parts: the phenomenon, the stage, the study, and the findings. In combination they make up a coherent whole, first by introducing the new phenomenon that is the theme of the research, then by defining the professional and theoretical context which sets the stage for the elaboration of the study, and finally by presenting and discussing the study's findings. Each part is described in more detail in the following sections.

The phenomenon
The theme of this study is an emerging and diffuse phenomenon subject to many different interpretations. This part therefore describes the emerging phenomenon, hereby called 'vision projects', so that the readers of the thesis have a common point of reference.

Firstly, the chapter, **"Radical Concepts,"** looks at the phenomenon from a historic perspective and follows the evolution of radical innovation since the industrial revolution. It leads us towards an overview of recent developments, that together, add up to the emergence of vision projects. In the following chapter, **"State-of-the-art Portfolios,"** the outcome and methods of two leading companies in the field are reviewed so that we also obtain an in-depth view of the current state of the phenomenon.

The stage
To be able to conduct a specific and thorough study, it is first necessary to perform a pre-study describing the stage within which the study will unfold. This part will therefore investigate, and to a certain extent define, the professional and academic context, to achieve a suitable foundation for investigating the research questions.

In the first three chapters the professional context is thoroughly investigated and defined. The chapter, **"Modern Challenges,"** seeks to answer why modern organisations invest considerable resources in radical innovation, which has no immediate benefit for their current business. In the next chapter, **"Innovative Capability,"** we investigate how vision projects can enhance the capability of organisations to be innovative. Finally, in the chapter, **"The Innovation Map,"** the desirable qualities of the outcome of vision projects are defined, in order to optimise their functionality as a means enhancing the capability of organisations to deal with modern challenges through innovation.

Hereafter we shift our perspective to the academic context of the research. To begin, the structure of a methodological framework is described in the chapter, **"Framework Structure,"** and provides a basic understanding of how a framework can be manipulated and constructed. Thereafter, the chapter, **"Contemporary Methodology,"** reviews already existing methodology which is used for projects similar to vision projects. The review outlines a basic process which serves as a methodological foundation for the development of more specific methodological approaches. It also presents a wide range of models which provide points of reference and inspiration for the construction of more specific approaches.

The study
The central part of the thesis is the study itself. It begins by presenting the thoughts that went into the set-up and execution of the research in the chapter, **“Research Approach.”** It explains the particular characteristics of this research project and discusses how to meet the requirements of both practical relevance and scholarly rigour. A detailed research method is presented and the criteria for producing research of high quality is discussed.

Hereafter the material generated by the research process is described in detail. It consists of four iterative research cycles that are presented in the respective chapters titled, **“Research Cycle 1,” “Research Cycle 2,” “Research Cycle 3,”** and **“Research Cycle 4.”** Each research cycle adds to the accumulation of knowledge that eventually may provide the answers to the research questions.

The findings
The accumulated learning from the four research cycles is presented and discussed in this final part of the thesis. In the first chapter,**“Analysis and Learning,”** the emphasis is on the creation of an overview of the accumulated knowledge that was built up across all research cycles, as documented in their respective chapters in part three. These insights are then elaborated in relation to the two research questions in the chapter, **“Answers.”** The chapter concludes with the outline of a new approach and guidelines for how to integrate the approach into the overall basic process. The chapter, **“Discussion,”** sees the findings in a bigger perspective and prepares the ground for the following evaluation of the practical relevance and academic contribution of the research. Finally, **“Conclusion and Perspectives”** summarizes the findings, evaluates the research design, and proffers recommendations for further research.

THE PHENOMENON

The theme of this study is an emerging and diffuse phenomenon that is subject to many different interpretations. In this part we therefore seek to describe the emerging phenomenon which has been labelled 'vision projects', so that the readers of the thesis have a common point of reference.

Firstly, the chapter, “Radical Concepts,” looks at the phenomenon from a historic perspective and follows the evolution of radical innovation since the industrial revolution. It leads us towards an overview of recent developments, which in union add up to the emergence of vision projects. In the following chapter, “State-of-the-Art Portfolios,” the outcome and methods of two leading companies in the field are reviewed so that we also obtain an in-depth view of the current state of the phenomenon.

2 RADICAL CONCEPTS

In this chapter, radical innovation is studied from a historic perspective with the purpose of providing an overview of the main areas of theory and practice which have shaped the many forms of radical concepts over time.

2.1 EARLY INVENTIONS AND VISIONS

The history of radical concepts started with architects. They have for several centuries been proposing grand visions of how to organise cities, create lively communities, comfortable housing, efficient work-places and improve people's everyday life. The strong bonds between the arts and architecture have fuelled intellectual debates and well into the 20th century they have dominated the field of innovation.

The utopian visions drew for the first time a wider attention when Thomas More published *Utopia* in 1516. Herein he introduced a provocative and novel view on architecture by stating: *"Houses are built to live in, and not to look on"*. About the same time Leonardo de Vinci sketched several future products, such as the helicopter, the parachute, the submarine and the car. It was not until 300 years later that his ideas were improved upon.

The re-construction of Barcelona in the 1850s is an example of one of the first implementations of an architectural master plan with a humanistic approach. The plan built on an analysis of working-class conditions of the time and focused on people's need for sunlight and greenery in the surroundings, as well as natural lightning and ventilation inside their homes. Streets were optimized to accommodate pedestrians and assure a seamless flow of people, goods, energy, and information. Even though entrepreneurs over the years have overruled some of the good intentions of the reconstruction, Barcelona remains one of the most liveable mega-cities of the world.

Hand in hand with the industrial revolution emerged the field of design and new ideas about manufacture and products. The first public exhibition was organised by the Royal Society of Arts in London during 1756, where prizes were offered in various categories. This was followed by exhibitions in France, the United States, Italy and other industrialized nations. In 1851 the first international exhibition was held with the title: 'The Great Exhibition of the Works of Industry of All Nations'. The exhibition has been repeated ever since, but changed its name to 'World Fair' and later to 'Expo'. Until 1938 these expositions focused on trade and were famous for the technological inventions on display (Wikipedia contributors 2010). A major attraction of each Expo is the building raised to host the exhibition. They are made by

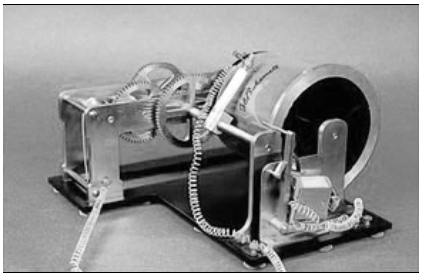

Figure 2.1: Fax at Word Fair (1851).

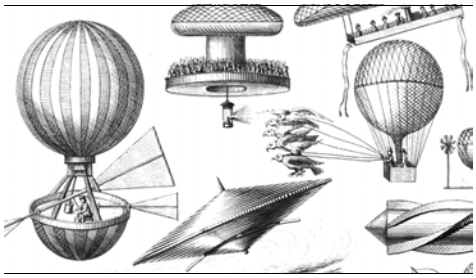

Figure 2.2: Flying machines (1885).

Figure 2.3: Picture phone (1939).

state-of-the-art building materials and techniques, and are designed by the world's most renowned architects. Many of the earlier buildings stand today as guideposts for future, which have not arrived yet (Kihlstedt 1986).

The Futurist Manifesto from 1909 marked a high point in an unlimited idealization of technology and love for *"speed, aggression, human masses, patriotism, militarism, war"* (Kruft 1994, p.403). However, the two world wars effectively set a stop to the most extreme expressions of futurism.

Social critic

Not everyone shared the mainstream architects' and engineers' visions of a wonderful new world based on technological progress. There were groups of industrial designers that were critical of technological progress as early as the mid-19th century. In those days the design profession did not have the same legacy as architecture, and their responsibilities were confined to superficial decoration of the industrial products that engineers had developed. Nevertheless, groups of socially conscious designers emerged, when the negative social consequences of the new modes of production became apparent. In a counter-offensive to the Industrial Revolution it was proposed that the arts and crafts production mode should be re-established to improve the living conditions of workers and hold at bay the aesthetically impoverished industrial design. It was about the same time in history that John Stuart Mill formulated a philosophy of utilitarianism, stating that the moral worth of an action is determined by its outcome, which gave legitimation to the critical movement. This marked the beginning of functionalism and the decline of historical formalism.

Socially conscious architects and designers worked closely together. For example, Le Corbusier and others prominent architects sought to unify the design of the house itself right down to the teaspoon with the participation of the tenants in a building named the Weissenhof Estate (1927). The goal was to offer a utilitarian design and was advertised as a blueprint for the future workers' home.

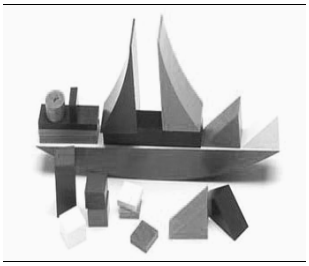

Figure 2.4: Building blocks. Bauhaus (1924).

Figure 2.5: Stacking chairs. Bauhaus (1926).

Figure 2.6: Chair and mask. Bauhaus (1926).

Figure 2.7: Chaplin force-fed by machine (1936).

A criticism of the dehumanizing effects of the machine was also voiced by the comedian Charlie Chaplin in *Modern Times* (1936) and later by Jacques Tati in *Mon Uncle* (1958). Many writers and filmmakers have portrayed technology as an evil for society. Some of the earliest and best known were filmmaker Fritz Lang in *Metropolis* (1927) and writer George Orwell with *1984* (1949).

Well into the 1960s, the socially responsible and functional approaches to design were further elaborated by the Bauhaus and School of Ulm. They proposed that the investigation of the objective and scientific conditions of design can bring about democratic change in society. The field of social design created a strong conceptual and methodological foundation for designing strong, value-based visions of everyday life, but as in architecture, it was not based on an analytical approach to seeing into the future.

Post-war optimism

After the second world war, new materials and space travel fuelled imaginations of the 1950s and 1960s. A positivist technological visual language emerged with Luigi Colani and Verner Panton, who took advantage of the new freedom offered by plastic to make curvaceous and emotional designs.

After 1957 Disneyland, in California, offered a tour of the *Home of the Future* (Horrigan 1986). The attraction was sponsored by Monsanto Company and engineered in collaboration with MIT. The fibreglass house featured household appliances such as microwave ovens and was set in a fictional 1986. In the first six weeks it was seen by over 435.000 visitors. A second era of world expositions started with the *Building The World of Tomorrow* exposition in New York in 1939. The new optimistic futuristic epoch focused on cultural significance and global issues of humanity. In light of the cross-cultural dialogue and exchange of solutions that defined the Expos, the exhibitions became an excellent opportunity for companies to present consumer goods.

Figure 2.8: “Hospital in the Sky” by Arthur Radebaugh (1958).

Figure 2.9: Vision of the future kitchen (1943).

Figure 2.10: Ad: "This is how you will live tomorrow" (1944).

For the Brussels World Exhibition of 1958 Philips made a prominent exploration into the future, called the *Poéme Électronique*. The event was designed by a trio of composers and architects including the famous Le Corbusier. The exploration was followed up by a presentation in 1964 of *The Home of 1975* (Marzano 2006), that promoted a more integrated use of electrical equipment in the home. In the same period Philips employed the industrial designer Syd Mead to work for their creative 'wildcats team'. Since the 1970s Syd Mead's vehicle designs have been an important feature of many science fiction movies and computer games.

The glorification of technology and the future can also be recognized in the concept of a *Walking City* (1964) by architect group Archigram and in Peter Cook's later biomorph *Kunsthaus* (2004) in Graz. The later is commonly referred to as the 'friendly alien' and has a light emitting outer skin which enables it to communicate with the surrounding city.

Figure 2.11: Concept for United States Steel by Syd Mead (1961)

Figure 2.12: Ad for fridge (1965).

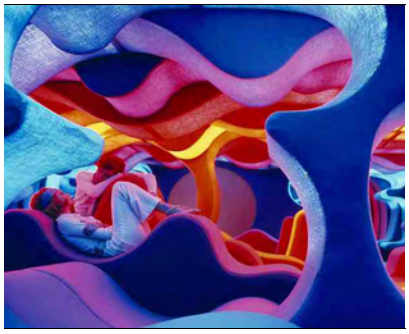

Figure 2.13: Verner Panton’s Visiona II. Commisioned by Bayer AG (1970)

2.2 ANALYSING THE FUTURE

In the 1960s, systems theorist Herman Kahn developed the first analytical studies of the future for the US Government. The American-dominated field of future studies had an ear with the US government on the highest levels and was soon invited to the executive meetings of multi-national companies. The popularity of the field was further fuelled by the best-selling authors and futurists John Nasbitt and Alvin Toffler, who reached a status as professional gurus.

An important moment in the recognition of future studies occurred during the oil crisis in the 1970s, when the Dutch energy company, Shell, used scenario planning to deal with the crisis. Future studies developed a comprehensive repository of methods and tools for various purposes and settings, which was readily absorbed by companies, who at the time were developing market strategy as a core competence. Since then, foresight and strategic planning have been key elements of the management of multi-national companies.

Corporate foresight

> *"Foresight is the process of developing a range of views of possible ways in which the future could develop, and understanding these sufficiently well to be able to decide what decisions can be taken today to create the best possible tomorrow." (Horton 1999, p.5)*

Since the 1980s the future studies community has been in a crisis - mainly due to its own success. In a 2006 survey, it was found that 60% of top management in European companies regularly participate in foresight (Norman & Draper 1986). Mahaffie (2003, p.4) states that *"The need for longer term thinking is recognized nearly everywhere"*. The problem is that people bring foresight into organisations without ever realizing that they are working as futurists. In other words, the popularity and diffusion of futures thinking into corporations have made the field itself superfluous. In addition, the rapid and uncontrolled growth of future studies has made the community fragmented; without an ongoing renewal of the ageing tool kit, professionals have had nothing new to come back for (Hines 2003).

The future methods and tools have not only been adopted at the strategic levels of corporations - know as Corporate Foresight - but have also been integrated in a number of other disciplines. Scenario planning, in particular, is a widely acknowledged method, and Hines (2003, p.21) observes that *"Futures in the organizational context has been slowly re-appearing, but in non-traditional places, such as market research and new business development"*.

There are still pockets of traditional futurists embedded in think-tanks, but their influence is far from what it used to be. The Institute For The Future in California is one of the surviving dinosaurs that has managed to renew itself in the past 40 years and continues to publish reports on a regular basis.

The futures field concentrates on general society, markets and global factors, so it does not produce tangible future concepts. On the other hand, future methodologies have been instrumental in creating a foundation for futures thinking across a range of disciplines and is widely used for developing futures concepts.

Trend research

In the late 1970s marketing departments increasingly used market research to support their business strategy. This marked a first step in a gradual reorientation of a company's core competence from strategy and markets to

innovation and users. In succession followed a new industry of trend research which used methods from futures research and sociology to predict markets and lifestyles. The specialized trend agencies typically predicted up-and-coming lifestyle trends and presented them to clients through magazines, biannual events or exclusive, custom-made presentations for selected clients. Today there are several websites which accumulate the latest from around the world with the help of thousands of trend-scouts.

The time horizon of trend research is normally 6-18 months, but some industries, e.g. the automotive industry, require a longer perspective and look as far as five to ten years ahead. A typical trend forecast consists of 5-15 general trends in lifestyle or technology, which are communicated to the client company's marketing and R&D department. The R&D department then seek to understand how these trends may affect the business area of the company and develop concepts for future innovations to take advantage of these trends.

Figure 2.14: Trend analysis of a decade by The Institute for the Future. (2005)

User innovation

During the 1980s and 1990s globalization had a profound effect on the way business is done around the world. The change has been driven by global trade agreements, the Chinese 'open door' policy, and advances in information technology. Around the world geographical, technical, political and cultural barriers are eroding and the effect is felt even in the most isolated areas.

Companies are now facing tougher competition than ever before in markets that are increasingly complex and volatile, but also full of new opportunities. Business leaders and politicians agree that innovation is the only way for companies to maintain competitiveness and profitability, such that *"innovation has become the industrial religion of the late 20th century"* (Valery 1999, p.5). The increased focus on product innovation - particularly user-oriented innovation - shifted the balances in companies, so that the R&D department, which previously followed orders from above, became the key to the company's survival.

Skunkworks

Demands for a continuous flow of high-level innovations led to a restructuring of R&D to facilitate out-of-the-box innovation. Multi-disciplinary teams with a mix of engineers, industrial designers, ethnographers and sociologists became commonplace in most companies and trend research was a central factor in the pursuit of new innovation. As a preliminary step in the search for radical innovation, many major companies conduct conceptual vision or future projects to inspire their research and development, but also to provide a window for early interaction with consumers, so that new products will have a higher success rate.

For some companies the idea of specialized, forward-looking research units was old news. In the 1960s the invention of microchips led, as with other new technologies, to an exploration of how they could transform the world and the kind of value propositions that the technology could offer. For example, in 1967 the Philco-Ford Company released a series of short films titled *1999 A.D*. One clip shows online shopping and predicts that all paper work is done online. There are no keyboards, but a row of buttons facilitate interaction. Another clip showcases an intelligent and automated kitchen for maximized health.

Figure 2.15: Computer concept for 1999 (1967).

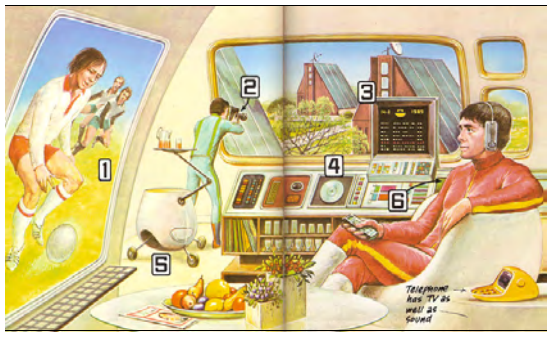

Figure 2.16: Future living room (1979).

It was widely assumed that the computer would make offices paperless by 1990. For Xerox, which made a living of selling copying machines, it was an alarming prospect. In 1970 Xerox created the Palo Alto Research Centre (PARC), near Stanford University, to explore the possibilities of the new technology and hopefully lead Xerox to dominate the office of the future. PARC was financially well-funded and soon became a haven for scientists, engineers and cognitive psychologists. Among others, PARC invented the computer mouse, laser printer and desktop-style computer interface which continues to dominate offices 40 years later.

The intensive and creative research units, with their mix of scientists, specialists and artists, were quickly recognized as a powerful incubator of new ideas. It was popularly named a 'skunkwork' because of the secrecy around their works. In the mid 1970s the word entered the business jargon (Sibbet 1997).

A skunkwork is often accompanied by a laboratory with a home-like setting in which test subjects can come and live for days or weeks and try out new solutions, while researchers observe them. The European Living Network is a partly EU-funded organisation which coordinates many such laboratory projects on European ground. On American soil Microsoft, HP and others opened in 2008 the *Innovations Dream Home* at Disneyland with the aim of showing how technology can create a fun and interactive environment for people's lives.

Figure 2.17: “Magic Mirror”. Innovation Dream Home (2008).

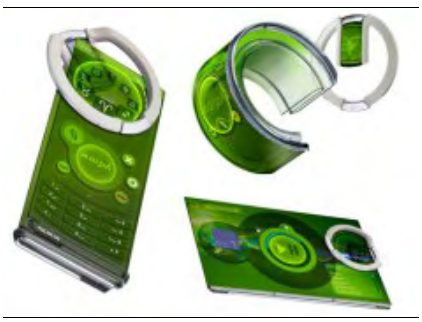

Figure 2.18: “Morph”, nano-science communication device. Nokia (2007).

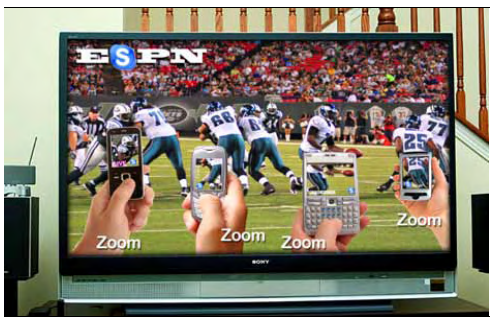

Figure 2.19: Redefining the fan-experience. Skype and IFTF concept (2009).

The skunkwork's object of investigation has changed over time. Until the end of the 1980s, the focus was on micro-chips and their significance for 'the office of the future'. In the 1990s, ambient technologies and the market orientation towards consumers entailed investigations into 'the home of the future'. Since the turn of the century mobile communication and social networking have held the promise of the future. As one might expect, leading telecommunication companies like Ericsson, Nokia, AT&T and Skype have shown future concepts in the past few years.

The concepts coming from the skunkworks are typically exhibited in popular magazines (Wired), trade-fairs (CES of Las Vegas) and festivals (Aarts Electronica), where technology specialists gather and show off their cutting-edge concepts.

Concept art

Companies whose expertise is within more traditional technological domains also have to innovate and find new ways to bring new value to their customers. One way is to arrange design competitions to inspire new product development, connect with trendsetters and pick-out the best candidates for employment.

Design competitions are not a new phenomenon, but in recent years they have generated increasingly valued innovation and out-the-box concepts. In some instances the theme of the competition is framed in the future, but it is not required to follow an analytical approach, so it is commonly interpreted as just another way to encourage participants to envision a completely new context with no strings attached. Braun and Electrolux are some of prominent companies that organize competitions and award prizes.

The divisions between design, innovation and future visions are seamless, so in the international design competitions and awards, it is possible to find a mix of all three categories (Bosch prize and Red dot Award, IDSA awards). However, over the past two decades there has clearly been a shift towards more radical innovation.

Figure 2.20: Interaction cushions. Martin Azua (2000).

Figure 2.21: Domestic water system “re-House” by Fulguro (2004).

At the intersection of concept and future design, The School of Design at the Victoria University of Wellington in New Zealand has a programme dedicated to Design Led Futures. It has been running since 2004, and is one of the few educational programs dedicated to holistic future scenarios. The purpose is to encourage an open and free discussion about how people wish to live in the future. Each year is sponsored by a particular company which, in return, becomes the subject of the students' projects.

2.3 VALUE-BASED TRANSFORMATION

The turn of the millennium has been a frustrating event for many futurists. It was a milestone for many future visions, and as the date came close, it was

all the more apparent that their visions were not going to come true. In 1997 The New York Times wrote: *"Our goals as a people are not these pie-in-the-sky objectives that people grew up with in the 50's. They settle now for a house in the suburbs and to hell with the Moon. What's the point of building monorails if we can hardly get the car to work?"* (Schiesel 1997).

The count down to the millennium was not so much accompanied by celebration of what had been accomplished as by fear of a 'millennium bug' that would make electronic equipment crash. Another sign of the general resentment among futurists was seen when Walt Disney decided to go retro when renewing the theme park *Tomorrowland* in 1997. It marked a profound shift for a man who saw himself as the middleman between industry and the public when it came to communicating ideas of the future.

The trouble with our times
is that the future is not what it used to be
- Paul Valery

Others have found the mark of a new millennium to be an occasion to set new goals and change the world for the better. Best known may be the UN Millennium Project which is committed to reducing extreme poverty and achieving universal primary education by 2015. Designers have taken up the challenge and have experienced a shift towards philanthropic design. MIT is working on a One-Laptop-Per-Child project and Philips has developed a stove to reduce indoor pollution in developing countries. Others, like the prominent D.school at Stanford University and the Design Futures MA program at the Goldsmiths University of London, look at the underlying structures of society to help alleviate poverty. Competitions and awards, like the Buckminster Fuller Challenge, the Index Awards and the IDSA 2050 conference, have also played an important role in promoting and building a philanthropic design community.

Sustainable systems

Humanistic values are not new to the field of design and have roots going back to the mid-19th century, as described earlier. Particularly, in the 1970s there was a surge of attention with the release of the book *The limits to Growth* (1972), which was a broadly acknowledge warning on the well-being of earth. Among others, the designer Victor Papanek voiced his concern to the design community. Still, sustainability did not catch momentum until the 1990s when it once again became part of the public debate (Morelli 2006), and the optimistic belief in technological progress was replaced with a general concern about the state of the planet and society.

Figure 2.22: Future farm for 2050. ICSID conference (2009).

Figure 2.23: The 21st Century Prison by Hilary Cottam (2002).

Figure 2.24: The Future Library. Danish architecture students (2005).

One reason may be that designers have had limited powers to address such challenges. They have traditionally been confined to a narrow design brief, which does not leave much room for pursuing a fundamental change

of the world. The most direct and feasible way for designers to make a difference, was for several decades considered to be through the selection of more environmental friendly materials. However, since the 1980s designers have expanded their influence and are therefore also able to address the challenges in more complex ways, such as the product/service system (PSS) approach. The PSS approach takes the whole system that surrounds the production and use of a product as the object of design. The purpose is to reduce the ecological footprint and create empowered communities. It often involves changing people's habits and attitudes towards products, as may been seen in Manzini's (2003) solution-oriented scenario.

Today, designers are increasingly looking for real solutions to real problems, and are attempting to transcend the narrow business objectives which typically frame design projects. This is partly made possible by designers' increased standing in organisations, and partly because consumers, society and businesses have become more sensible to humanistic and sustainable values.

Critical European foresight

At the time that Herman Kahn introduced futures thinking in the US, there had long been a tradition for studying the future in France. In the 1930s Gaston Berger created a research centre in Paris for philosophical studies of the future. He invented the term 'prospective' for the study of possible futures (Berger 1964). However, while the American future movement quickly entered the international business world, the philosophical French futurists never made it to the same level. Instead they prepared the ground for a distinct European academic movement for technology assessment which took off in 1980s and primarily assists public institutions in policy-making (Schot & Rip 1997). The academic movement was based on a critical and constructivist sociological inquiry into society and technology, and is particularly purposeful in areas of technology where markets are non-existing or where there are conflicting views of the value of the technology, e.g. nano-, bio- or information technology (M. S. Jørgensen et al. 2009).

A small group of researchers have introduced a critical approach to understand the socio-technical aspects at the level of people and product in the area of design. They do not take for granted that people have certain needs and that products fulfil a particular function, but rather investigate how these meanings are constructed in a broader perspective. In 2002 a masters program was started at the Technical University of Denmark, which teaches design students socio-technical theory and provides new approaches to inquiry about design-related problems. The understanding of people's needs also opens up new ways of addressing sustainability and reducing the consumption of resources in people's everyday lives. The field is just starting to find its own feet and the Sustainability Department of Industrial Design at Delft University of Technology is among others finding ways to implement such an approach.

Public services

In 2005 Hilary Cottam was honoured with the title “Designer of the Year” by the Design Museum, United Kingdom, to the surprise of the design community. She was not a trained designer of 'things' but instead applied a design approach to social issues. In close collaboration with public authorities and with the involvement of the local actors, she had facilitated redesign of schools, prisons and healthcare services. For the prison project she put together a multi-disciplinary team of architects, criminologists and prison governors to develop an alternative prison for the 21st century. The final

concept lowered the cost of surveillance and freed up resources for educational programs for the inmates to combat high levels of re-offence.

For architects, the twilight zone between political, business and social issues is a territory that they know well from designing public buildings and spaces. They have a tradition for applying a holistic approach and architects are increasingly using ethnographic and designerly ways of dealing with social issues. The winning proposal of a competition on the 'Future Library' in 2005 at a Danish school of architecture, for example, was based on user probes, design games and personas.

Figure 2.25: Scenario for product-service-system (Manzini & Jegou 2003).

Shared vision

The fusion of methods from design and social action is another interesting constellation in the pursuit of radical visions and concepts. For example, it is not unusual for business and design consultancies to use large visualizations - murals - as a vehicle for developing common vision among employees and stakeholders. The design event Index 2005 in Denmark used visual facilitators to develop common visions of how to “improve the quality of life” and mixed them with ethnographic methods to understand people's everyday lives. The approach is taken from the field of social action, which has a long tradition of making murals to express the history, hopes and future of minorities or social groups. These political works of art were particularly popular in Mexico and the United States at the time of the financial crisis in the 1930s. The depiction of common futures had a revival during the social movement in the 1960s and murals have recently been used to portray scientific ignorance of nuclear energy and genetically engineered plants (Horn 2006). Within the field of design, the design researchers Paul Hekkert (2001) and Erik Lerdahl (2001) are creating methods for developing values and translating them into concrete product proposals.

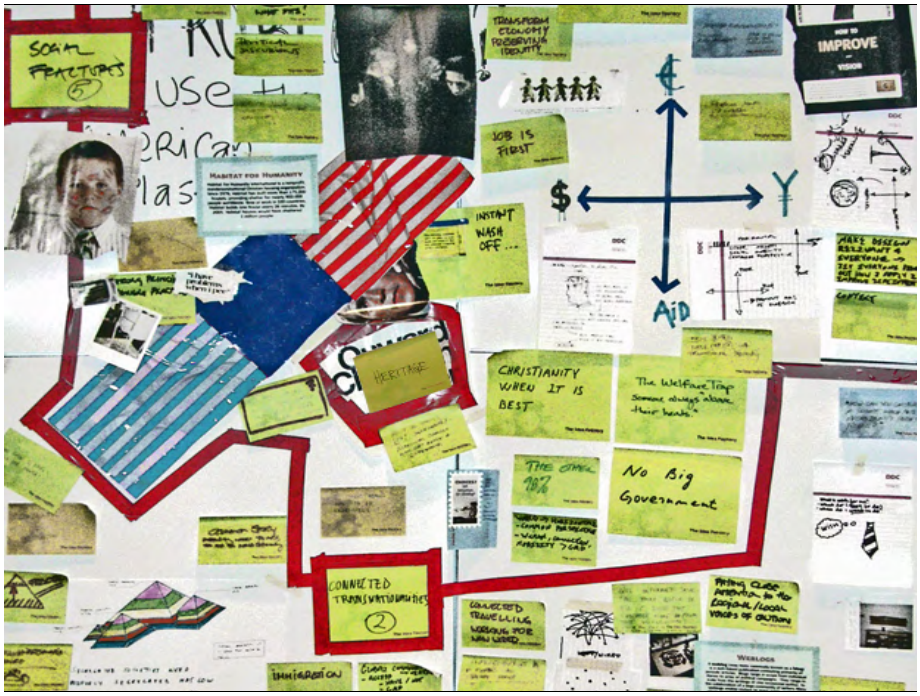

Figure 2.26: Towards a shared vision. Index conference (2005).

2.4 REFLECTION

The importance of vision projects
The review of radical concepts from a historical perspective substantiates the claim that vision projects is an emerging phenomenon currently taking form in the intersection between several fields of practice and theory as a result of uncoordinated efforts by a variety of individuals and organisations. It is interesting to note that there exist periods in which certain types of radical concepts and visions are dominant. For example there have been several periods in which radical concepts have been oriented towards humanitarian goals. Likewise it has been a recurrent theme to either see technology as a saviour or a threat to humanity. However, even though radical concepts have a long history, and in some aspects even seem to be cyclic, the review also indicates that an unprecedented landmark development may be under way. It seems that the combination of a thorough analytical approach with design thinking constitutes a powerful new combination which, with the backing of industry and politicians, may create a momentum that give vision projects a central role in society. The review thereby substantiates the motivation for this study.

Future concepts, social design or concept design.
The review illustrates how difficult it is in practice to distinguish one type of innovation project from another. There are fluent transitions between a number of different types of radical concepts which are called by a variety of names, such as social design, concept design or future concepts. It is symptomatic that different labels are not applied consistently. For example, the term 'future concept' is used for ideas that are no more than a creative exercise and have nothing to do with the future. At the same time there are also well-researched concepts which propose fundamental social change, but do not make use of the word 'future'.

The visual representation of a concept may also seduce, or even mislead, the spectator into making false assumptions. Far from all concepts dressed up in futuristic style involve fundamental changes which justify a future setting. A concept therefore cannot be categorised based on its labelling or visual style, but requires an analysis of several parameters, such as:

_ **The object of design**
Is it a superficial styling of an existing product? A new technology with a new function? A new form of interaction? A new way of doing something already known? A completely new activity? A new business model or a product-service-system?

_ **Degree of change**
To what degree does the concept assume fundamental change? The review shows that there is a seamless transition from concepts which are regular design concepts to concepts which assume fundamental changes and have great innovation potential.

_ **Scope of context**
What kind of change does the concept assume? A new technology? New social norms? Or a combination of social, cultural, political, economical and technological factors.

_ **Analytical versus creative**
Is the proposal based on a profound analysis of the context or is it primarily a free creative exercise?

_ **Type of value**
What kind of values is the concept promoting? Is it an economically motivated concept or does it contain humanistic or sustainable values?

The review does not lead to a more specific formal definition of vision projects, but the description of the spectrum of radical concepts, and the listing of important parameters for assessing concepts, provides for a more experience-based understanding of the phenomenon. In the following chapter this understanding will be further developed by a description of the portfolios of radical concept portfolios from two leading innovative organisations.

3 STATE-OF-THE-ART PORTFOLIOS

In this chapter we will review the visionary works of two pioneering companies: Philips and Siemens. The two stand out from the crowd of innovative companies, because they have persistently explored radical innovation opportunities for more than a decade on the basis of multi-faceted analysis and a visionary outlook.

3.1 PHILIPS DESIGN

Philips Design is owned by the Dutch multi-national electronics corporation Philips with headquarters in Eindhoven, the Netherlands. It is an independent consultancy, but has a close collaboration with Philips Research and other business divisions. Design has been an essential part of Philips since 1925 and they have presented proposals for radical innovation early in its history, as described in the historic review of future concepts in the preciding chapter.

When the Italian architect Stefano Marzano was appointed head of design in 1992, the consultancy initiated an ambitious endeavour to explore radical innovation. We will start the review with the *Vision of the Future* project (1996), which marked a milestone in the field of design in its comprehensive analysis and visionary proposals for the year 2005 – far beyond the horizon of conventional market analysis.

Vision of the Future
The objective of the Vision of the Future project was to propose ways in which new technology could improve the quality of people's lives and show the advantages of changing from a mindset of quantity and complexity towards a focus on quality, simplicity and customer satisfaction. These ideas were to be presented in public in the form of realistic objects and the context in which they could be used, so that people could respond and provide Philips Design with information so they could offer more appropriate products and services in the future.

To start with, extensive research was conducted in two main areas: socio-cultural and technological trends. It was found that the perception of time and space are the main parameters that determine how people will act and think in the coming years. Furthermore, these parameters interact with more specific trends, such as subjectivity, sociability, exploration, connectivity, ethics and holism, to produce a wider variety of behaviour patterns. The technological research identified increasing computing power, voice recog-

Figure 3.1: Vision of the Future. Philips Design (1996).

nition, virtual agents, smart materials and micro-chip sensors, among others, to be influential for the functionalities of future products.

Next, Philips Design set up multi-disciplinary teams consisting of anthropologists, sociologists, engineers, product designers, etc., who in a series of workshops developed more than 300 scenarios based on socio-cultural and technological research. Thereafter the scenarios were distilled into 60 concept descriptions and categorized according to four main domains of everyday life: personal, domestic, public and mobile.

The study presented a number of smart ways to interact with electronic devices and new functionalities that made it easier for people to gain access to information, communicate with friends and colleagues, monitor and control the home, etc. Apart from the concepts which dealt with the efficiency and ease with which people go about their everyday lives, there was a substantial collection of concepts that addressed more sensible human aspects, such as emotional communicators (and containers) to give assurance, recall a memory, or reinforce a bond. The collection also featured a make-up box for the virtual world to retain privacy and mask identity, and an interactive family tree which could help family members feel closer and more in touch and diminish feelings of separation and isolation.

Unlike the typical future concepts, they were styled in visual language with much reference to the human body and everyday context. With the aim to communicate the concepts to the wider public, the concepts were presented at various exhibitions and events together with video clips illustrating how, where, by whom and for what purpose they might be used. Furthermore, a website and book about the project were produced.

Many of the ideas of the *Vision of the Future* project were elaborated in more specific studies over the following years. The *Home of the near Future* project (1999), for example, presented an exploration of the domestic environment and a proposition for the future, while the *New Nomads* (2001) investigated wearable electronics and smart textiles.

The emerging field of 'ambient technology' was given continuous attention by Philips Research and in 2002 they opened a home-like laboratory in which ordinary people could test and experience new concepts. The book *The New Everyday* (2003) summarized the project. Through the 24 future concepts that Philips had developed in the preceding years they explored the future possibilities of ambient technology. More than 60 experts in technology, design, social sciences and business had participated and presented the 24 concepts which sought to enable a natural and social interaction within the digital environment. Further developments were recorded in the book *Ambient Lifestyle* (Aarts & Diederiks 2006)

Simplicity

In 2004 the “Let's make things better” company slogan was substituted by the brand tagline “Sense and simplicity” in order to clearly position Philips as being people-oriented, and not technology-oriented, as in the past. In the following years Philips Design played a key-role in the transformation of the company by outlining the philosophical foundation in the corporate magazine *New Value by Design* and by presenting future concepts which show how the brand tagline can be translated into concrete products.

From 2005 to 2008 an annual event was hosted to allow customers, media, government representatives and employees to experience radical concepts in a real-like context.

At the first event 25 design concepts demonstrated how the new 'simplicity-led design' could shape products over three to five years across the

healthcare, lifestyle and technology sectors. The concepts were divided into 5 groups:

_ Trust: Making the experience of a MR scan less frightening.

_ Care: Control of indoor climate. Growing herbs in the kitchen. Pure drinking water. Soft massage cloth.

_ Glow: Intuitive control of the ambience of a room by manipulating colour and intensity of light.

_ Play: Capture and projection of still images. Remote control of TV.

_ Share: Communication with friends. Watching digital images.

The following year, the main theme was 'healthy lifestyle' and 15 “Next Simplicity” concepts were presented with the objective of improving well-being and quality of life for people. The concepts were divided into five sub-themes with direct reference to a person's physical, mental and social situation:

_ Listen to your body: Motivational health rituals to guide you in staying healthy.

_ Care for your body: Sensory therapies to energize and rejuvenate your body.

_ Move your body: Challenging exercises and games to get you active and keep you fit.

_ Relax your mind: Expressive means to engage and soothe your mind.

_ Share experiences: Spontaneous ways to share moments and mementos with family and friends.

Figure 3.2: Simplicity 2006

As the years passed the earlier simplicity-led concepts were further developed, so the Simplicity Event also became a platform for the launch of new products. The 2007 future concepts continued the people-centric approach under the headline “caring for people’s well-being”. Importantly, the objective was now to create an “enabling environment”, rather than individual products. A total of three environments were presented, each containing 2-5 specific future concepts:

_ Ambient Healing Space: A hospital room which contributes to the quality of the patient’s health and happiness while providing the caregivers the tools to enable them to enhance the patient’s well-being.

_ Celebrating Pregnancy: Pregnancy is not an illness, so ultrasound and other prenatal care should be comfortable and enjoyable for the parents-to-be.

_ Daylight: Making a hotel your personal space where you can relax and re-energize after a long journey.

The future concepts for the Simplicity 2008 event were a call for interaction under the headline “Healthy People, Healthy Living, Healthy Planet”. The objective was to empower people to become change agents of their own

environment. This is done by increasing people's daily awareness of and contribution to a better environment. Beyond raising this level of understanding, the concepts explore solutions that deliver both emotional and tangible benefits to those who engage in responsible activities.

- Circle Of Life: Promoting customization and personalization of products as a way of involving customers as creative participants in a product's life-cycle.
- Light Blossom: An outdoor lighting that transforms the personality of any community from industrial to ecological and uses sustainable sources of energy.
- Green Cuisine: The concept stands for cooking with consciousness by putting relevant knowledge at your finger tips.

Surprisingly, these three future concepts were a departure from the previous years' increasing focus on healthcare. They introduced a planetary perspective on people's everyday lives which Philips had not previously explored.

Figure 3.3: Simplicity 2008

While the Simplicity Event is the uniting theme across all business divisions of Philips, many other research activities take place in parallel. The individual business divisions have their own research centres which collaborate with Philips Design on a regular basis, and Philips Design has programs that design for philanthropy or sustainability, or conduct probes into the far future of 20-30 years. As such, the general exploration of the future is taking more specific forms depending on purpose, value-mission and time-horizon.

Methodology

Philips Design has a wide range of vision projects, which cover the full spectrum from opportunistic future-oriented to value-laden, sustainable innovation projects. These projects deal with complexities of different types, as reflected by their respective methodologies.

Future process

Philips Design divides their exploration of the future into two horizons. The short-term "Culture Scan," which enables them to keep abreast of developments as they happen, is integrated into the design process and acts as a means to adapt existing technologies to lifestyle trends. For the longer term, Philips Design has developed a "Strategic Futures" process, which looks five to seven years ahead. Anything beyond ten years is thought to be too uncertain, because it is difficult to predict trends for such a long timespan.

The research focuses mainly on technological and social trends, but these depend on a number of factors which are also included in the analysis, such as government policies, international standards, markets and lifestyle.

The Strategic Futures process is divided into five steps (Lambourne et al. 1997; Marzano 2006, p.603):

1. Analysis of socio-cultural and technological trends on a regional and global basis.
2. Multi-disciplinary teams explore in workshops how the trends interact in specific ways and give rise to new products and services.
3. Ideas are selected which are plausible, relevant to the company, and have the greatest potential to make the intended contribution.
4. Development of life-like models and simulations. Models are shown to people and feedback is used for developing products that answer the needs of people.
5. Revision of the original vision on the basis of the results, leading to a follow-up research project, development of new products or design-related competencies.

Sustainable innovation
Since 2005 Philips' vision projects are increasingly oriented towards sustainable innovation and less towards the future. The complexity is therefore first and foremost about understanding how products can play a role in people's lives and how they are influenced by social, technological and economic changes (Bielderman et al. 2007).

1. Analysis of people's daily lives over time, relationships and activities of different stakeholders.
2. Envisioning how the final design solution should help to change people's lives.
3. Identifying opportunities for new solutions to fill the gap between the current and the preferred situation.
4. Communication of vision to create a common ground within and outside the project team.

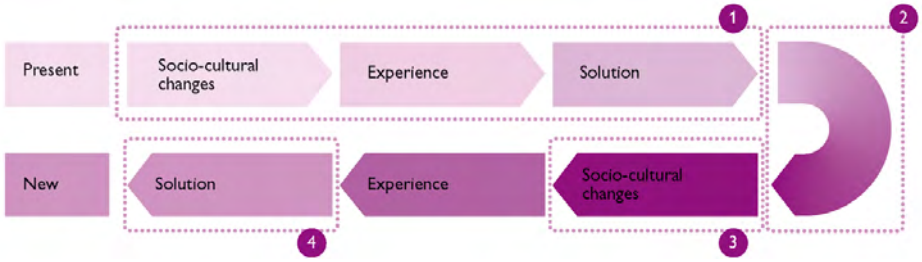

Figure 3.4: Philips' process for sustainable innovation. (Bielderman et al. 2007)

3.2 SIEMENS

German-based Siemens is another company which has persistently explored radical innovation opportunities. Since 2001 they have bi-annually published the corporate magazine *Pictures of the Future* which for each issue presents three future scenarios set ten to 20 years ahead in time. The so-called 'communication scenarios' aim to create a basis for dialogue with the public by presenting a wide range of topics and offering a large number of starting points for debate about the future. Each scenario is followed by eight to ten articles explaining the technological and socio-cultural conditions it is based upon and linking the scenario to research projects currently taking place among Siemens +30.000 researchers.

Over the years the magazine has presented an extensive collection of more than 50 scenarios, each of which has the potential for several concrete innovation opportunities. Each scenario evolves around an everyday situation and skilfully integrates solutions relevant to its main business divisions: automation, power, transportation, medical, information and communication. Given that much of Siemens business is directed towards serving professionals, most of the scenarios envision the everyday lives of professionals, such as a maintenance worker, doctor, entrepreneur, energy detective, or other professions that may exist in the future.

Figure 3.5: Entertainment scenario.

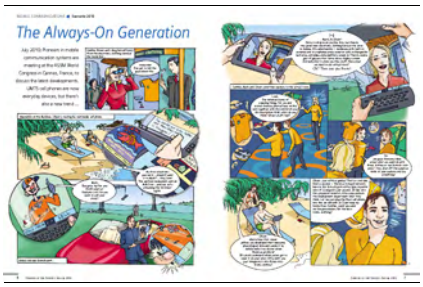

Figure 3.6: “Always-on scenario.

Figure 3.7: Cooking scenario.

A recurrent theme is the creation of a sustainable world. Therefore, many concepts aim to manage energy or reduce the environmental pollutants of industry and cities around the world. Rather than concrete products, the scenarios propose new infrastructures and service systems, which assume large scale interventions. Given Siemens' position as Europe's largest engineering conglomerate it is, however, not an unrealistic proposal. To a large degree such interventions cannot be performed unless the general public changes attitudes or political regulations are introduced – topics which are also addressed in the scenarios.

These large-scale interventions also have a direct impact on people's private everyday lives. Flexible power infrastructures makes it possible to manage their own energy consumption, but also to feed energy back into the system. A clean nature opens up for many outdoor recreational activities, and new medical systems, make it possible for people to monitor and prevent illness as part of their everyday. In the field of information and communication scenarios envision new experiences during cooking, watching sports, staying at a hotel, or simply staying in touch with others. These concepts address feelings of being a community, the joy of sharing with others, the comfort of being at home, and safety in people's private everyday lives.

The continuous stream of scenarios are supported by a foundation of thorough analysis of the future, which was documented in the *Horizons 2020* project conducted in 2004. The project began with the selection of five “important life areas” which were expected to drive change for the next 16 years and were not likely to be negated by events in the shorter term. The five areas were: politics, society, economy, environment, and technology. Through an extensive trend analysis two general scenarios of life and society in 2020 were presented (Scharioth et al. 2004).


Figure 3.8: The performance-oriented 'me' society.


Figure 3.9: The decelerated society

The first scenario was called 'The decelerated society' with the keywords: equality, freedom and modesty. It focused on social responsibility and contribution to community, as well as strong government to ensure security, equal opportunities and freedom.

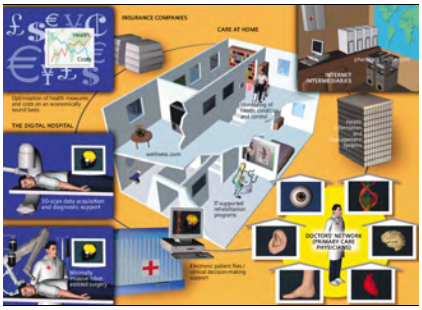

Figure 3.10: Medical opportunities.

Figure 3.11: Communication opportunities.

Figure 3.12: Transport opportunities.

The second scenario was named 'The performance-oriented 'me' society'. In contrast to the first scenario, it assumed the withdrawal of government from much public life. Industry's need take centre stage, with individuals becoming more welcoming towards continual change. The keywords of this scenario were: speed, network and risk.

The scenarios, which were commissioned by an external consultancy, were complemented by a technical report from Siemens itself on the future of its main technological domains. The social and technological reports were merged and further elaborated into an overview of future opportunities for each of Siemens business divisions. For each of the scenarios there was a detailed description of lifestyle, family, work, consumption, travel, leisure, health care, eating, education and security.

Overview

The scenarios represent different areas of focus such as: general society, everyday situations, people's lifestyle or new technologies. In some cases the scenarios are related. The general society and the business specific scenarios are, for example, provide the fundamental backdrop for ongoing development of everyday scenarios.

Generally, Siemens does not present attention-grabbing sleek prototypes like other companies, however a subsidiary of Siemens has created a handful of prototypes around future communication.

Figure 3.13: Future concepts for Siemens Communications.

Methodology

Siemens' vision projects employ two complementary approaches to explore different horizons of the future (Siemens AG 2004). Extrapolation, the first approach starts from the present and analyses emerging trends for technologies, products and user behaviour in the near future. The aim is to anticip-

ate the possible and develop road maps. However, Siemens has realized that in a complex business environment a leading global player cannot only rely on forecasting trends. They must strive to be an innovation trendsetter and to be “Inventing the Future”. Anticipation alone cannot reveal sudden discontinuities or radical innovation opportunities, so Siemens uses scenario techniques to explore the far future. The scenario methodology looks into influential factors such as social, political, environmental and technological future developments in 10 to 30 years as a basis of developing coherent visions of the future. The subsequent challenge is to connect the scenarios for the far future with anticipated near futures through a process called “retropolation”, so that the challenges that must be overcome to achieve the far future scenario are identified. Finally, experts draw up specific visions of how changes will impact Siemens' different areas of activity.

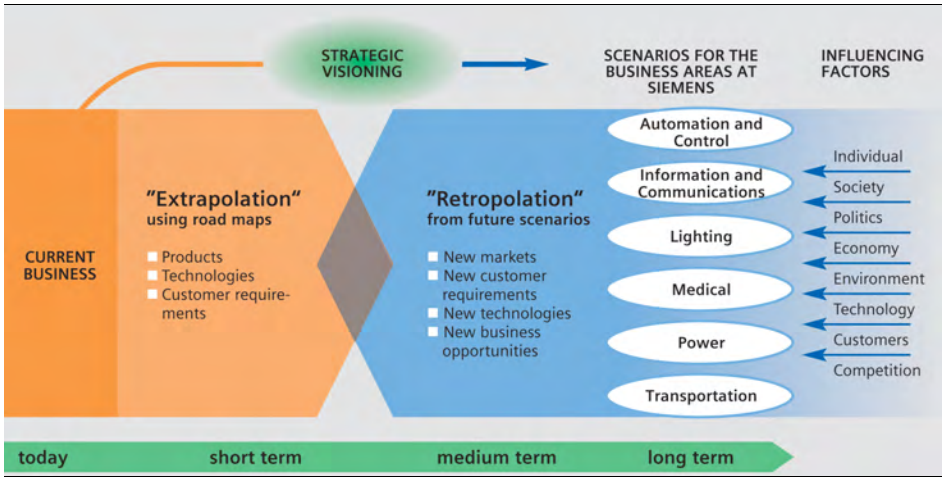

Figure 3.14: Siemens foresight methodology. (Volkmar Dimpfl & Frank Krull 2004)

Horizon2020

In 2004 Siemens initiated the “Horizon2020” project which used a scenario methodology to examine possible changes in the way Europeans live (Scharioth et al. 2004). An external consultancy, which was given the assignment, analysed political, social, economical, environmental and technological changes over a 16 year period. For each domain a number of qualitative or quantitative descriptors was assigned. An optimism index provided two separate scenarios that contained negative as well as positive elements. From the pools of descriptors, and a process of discussion, the consultancy developed two scenarios as described earlier.

This review will only cover the scenario methodology, because the main challenge is to create an overview of alternatives and innovation teams are already familiar with design methodologies.

3.3 REFLECTION

Both Philips and Siemens have over the years produced a comprehensive portfolio of radical concepts. The companies are traditionally technology-driven companies and the future concepts generally explore how new and emerging technologies can provide value to people and society. Typically, the concepts are framed as 'future concepts', but this label is an umbrella term for a wide range of different types of radical concepts.

Types of concepts

For example, Siemens explores creatively the technological infrastructures which support products and services, while Philips focuses on the possibilities of the products themselves within a relatively fixed infrastructure.

Siemens presents sketches of products, but they are only included to explain the overall infrastructure. Philips, on the other hand, produces functioning prototypes with the finish of a final product.

However, it seems that both companies are gradually moving towards designing activities and situations. Projects are framed around a certain situation in which an 'eco-system' of products and infrastructure enable or facilitate certain activities which give meaning and value to people and society.

Sustainability is a recurrent theme in Siemens' work over the years. Their concepts promise clean water and sustainable energy, but they also have a human touch and try to make the infrastructure a tool in the hands of people, not the other way around. Philips has actively branded itself as a human-centred consultancy, as clearly reflected in their concepts. In recent years this position has been supplemented with an all-encompassing care for humanity and the earth, and much like Siemens, they are proposing sustainable solutions. Even so, it may be noted that the types of concepts the two companies put forward are biased respectively towards products and infrastructures. Their concepts therefore complement one another and show what can be achieved by different approaches.

Presentation and use

With regard to the presentation of the radical concepts, it is striking how differently the companies use the concepts. Philips Design arranges events and develops working prototypes for employees and stakeholders to try out. In some projects they even arrange road tours for the radical concept to be shared with the wider public. The work is driven on a project basis with irregular intervals, with the exception of the period 2005-2008 when there where four consecutive 'simplicity' events. Several books have been published on Philips Design's projects, often explaining the projects' analytical foundation of the projects, and not simply the final concepts.

In contrast, Siemens present new concepts on a regular basis. Every half year three new future concepts – or scenarios – are presented in the corporate magazine. Each scenario is followed by a number of related articles, explaining the background of the scenario from a technological, and often also social, point of view. No prototypes, just rich illustrations.

The purpose

In trying to understand the differences between the work of Philips and Siemens, it must naturally be taken into account that their expertise, offerings and customers are very different. While Philips attends to end-consumers, Siemens caters to large private or public institutions. Corporate structures and cultures may also influence the way information is shared. Nevertheless, it seems that some of the radical concepts are immediately relevant for the development of new products, while others do not have a direct application. One is therefore prompted to ask, what is the purpose of vision projects? In order to investigate that question, we will in the following chapters investigate the modern challenges that organisations face, in hopes that it will lead us toward an understanding of why leading organisations like Philips and Siemens choose to invest vast resources in vision projects.

THE STAGE

To be able to conduct a specific and thorough study, it is first necessary to perform a pre-study describing the stage within which the study will unfold. This part will therefore investigate and, to a certain extent, define the professional and academic context, so that we achieve a suitable foundation for investigating the research questions.

In the first three chapters the professional context is thoroughly investigated and defined. The chapter “Modern Challenges” seeks to answer why modern organisations invest considerable resources in radical innovation which has no immediate benefit for their current business. In the next chapter, “Innovative Capability,” we investigate how vision projects may enhance the capability of organisations to be innovative. Finally, in the chapter “The Innovation Map” we look to define the desirable qualities of the outcome of vision projects, in order to optimize their function as a means to enhancing the capability of organisations to deal with modern challenges through innovation.

Hereafter we shift our perspective to the academic context of the research. To begin, the structure of a methodological framework is described in the chapter “Framework Structure” and provides a basic understanding of how a framework can be manipulated and constructed. Thereafter the chapter “Contemporary Methodology” reviews already existing methodology which is used for projects similar to vision projects. The review outlines a basic process which serves as a methodological foundation for the development of more specific methodological approaches. It also presents a wide range of models which provide points of reference and inspiration for the construction of more specific approaches.

4 MODERN CHALLENGES

The review of the vision projects and radical concepts developed by Philips and Siemens give evidence of the commitment of the two companies to explore radical innovation opportunities over the years. In the following we will seek answers to why innovation is important to these companies. Why would they spend resources on making speculative proposals, rather than investing in current development? In search of an answer we need to look into the dominant logic of modern organisations.

4.1 THE INNOVATION PARADIGM

It is widely recognized among executives, business academics and politicians that innovation is essential for business organisations to grow and contribute to the economy of nations (Utterback 1994; Christensen 1997; Leifer et al. 2000). The paradigm is so widespread that the popular magazine *The Economist* has proclaimed that: “Innovation has become the industrial religion of the late 20th century” (Valery 1999). In the past two decades, globalization has had a profound effect on the business environment. The removal of protectionist measures on a national level around the world and information technology has intensified competition dramatically and changed the dynamics of markets profoundly. The consequence is a saturated marketplace with commodified products, where constant and disruptive innovation is the only sustainable way for organisations to gain a competitive advantage and avoid painful competition on cost and price with diminishing returns.

The future belongs to those who prepare for it today
- Malcolm X

Radical innovation
An organisation's overall aim is to generate a steady stream of innovations, because it cannot rely on incremental improvements to its existing product portfolio. Scholars and business leaders emphasize that 'radical' innovation is particularly critical to organisations long-term growth (Schumpeter 1934; Kuhn 1962).

Radical innovation is a term widely used for innovations which assume fundamental change such as the creation of new markets or new levels of user value. It is opposed to 'incremental' innovation which seeks to exploit current context and build on existing technologies and markets (Bessant et al. 1994). The distinction reveals an organisation's degree of innovative ambition (Leifer et al. 2000). John Heskett (1997)proposes a more elaborate scheme for classifying different types of innovation that organisations should consider in relation to innovation strategy. The categories are: no change, incremental detail change, radical definition of basic concepts, and fundamental innovation. These categories map directly with the four types of innovation identified by Wiig (1993):

1. Automatic: Innovation that narrowly focuses on improving routine work
2. Pragmatic: Innovation that improves functioning within current practice
3. Systematic: Innovation that changes practices
4. Idealistic: When innovation assumes new perspectives and goals

For each category the complexity and uncertainty are raised, indicating a high level of ambition and willingness to run a risk.

Pro-active
In pursuit of radical innovation opportunities and in response to increasingly complex and volatile business environments, organisations must pro-actively look for new business opportunities. Brown & Eisenhardt (1998, p.243) state that "*The challenge is to react quickly, anticipate when possible, and lead change where appropriate"*. Companies need to gain the 'edges' and improvise, making ad-hoc strategies and following emerging opportunities. They must be alert and agile so that they can quickly match the external diversity and complexity and continuously reinvent themselves to produce a continuous flow of innovation (Nordström & Ridderstråle 2000).

There are many business gurus and scholars who state that the key to growth is to evaluate opportunities with an open mind and to look for opportunities outside the core business. For example Kim & Mauborgne (2005) advocate that organisations should even seek out emerging market opportunities which do not exist yet. The advantage to being a first-mover and to enter a new market with no established competition is an ideal situation for building competitive advantage.

Figure 4.1: Organisations must explore radical innovation in the high risk zone.

It is common to distinguish between three zones of innovation in an organisation's core business (Baghai et al. 1999; Leifer et al. 2000):

a) **The current core domain of operations**
This innovation aims to replace current offerings.

b) **The context around or between current business**
Typically there are a number of emerging opportunities which are somewhat related to current operations, but do not fall directly under them.

c) **The greater environment**
New and entirely unknown markets outside the strategic scope of an organisation.

A new game
Modern challenges redefine the game for creation of value in society and for how an organisation must act to secure its own short- and long-term survival. It is an opportunity for organisations to gain an advantage over competing organisations, but also a requirement, because other organisations will otherwise fill the position.

Scholars in innovation management widely acknowledge that society has passed through three to five generations of innovation paradigms during the last century (Rothwell 1994; Jin 2005; Berkhout et al. 2006), which have fundamentally changed the object of innovation and how innovation is created. It is considered a naturally evolving, spiralling process in which organisations compete to be better innovators. When a more successful approach is encountered it spreads to other companies, and thereby creates a demand for further improvement. Each generation sets a baseline for innovation models' efficiency and relevance of value creation in society.

The innovative performance of an organisation is the result of multiple factors, such that a new generation of innovation models may involve a reconfiguration of an organisation's internal and external structure, culture, knowledge management, and so forth.

Open innovation
In order to extend the potential reach of an organisation's innovative capability and decrease development time, organisations should not only rely on their own research, but explore options for buying or licensing knowledge. Chesbrough (2003) has named the new approach to management of technological knowledge 'open innovation'. The permeable borders between an organisation and its environment should also work the other way, so that internal research finds new uses outside the organisation in joint ventures, spin-offs or through licensing. Another option is to share research-related risk and cost by establishing research alliances.

4.2 USER INNOVATION

> *“Sony innovation and vision are changing the way we relate to technology, how we perceive the world and even how we perceive ourselves.” (Kunkel 1999, p.13)*

So far we have argued that organisations must aggressively seek radical innovation opportunities beyond their current core business. However, innovation may take many forms and not all are equally valuable. It is therefore an important part of innovation to understand the type of innovation that may create the most value at any given point in time.

Historically, the innovation offered by companies has focused on technology or market innovation, but since the 1980s the consumer has gained a

Textbox 4.1: Definition of innovation

Innovation is one of the key terms for modern organisations, but its definition is still vague. It is commonly associated with successful products that offer something new to the market.

Creativity, invention and innovation
It implies that an innovation must be a fully-equipped solution for a real world context. An idea or invention does not qualify by itself, but must be further developed into a concrete solution with an effect.

> *"While a new idea is a thought about something new or unique, and making that idea real is an invention, innovation is an invention that has a socio-economic effect." (Chayutsahakij & Poggenpohl 2002)*

However, being 'successful' and having 'an effect' are relative terms which only can be evaluated in retrospect, and even so, are subject to different interpretations. The term 'innovation' is therefore better suited as a statement of intention in the research and development context.

A process
The word innovation is also in relation to the process of developing an innovation. Drucker (1985) writes:

> *"Innovation is the process of equipping in new, improved capabilities or increased utility."*

stronger position in the saturated markets, and since the mid-1990s 'user innovation' has been the main paradigm for research and development. The business guru Prahalad (2005, p.57) says that “innovations must become 'value-oriented' from the consumer's perspective”, or in the words of Cagan (2002, p.54) “Breakthrough products are driven by a complex combination of value attributes that connect with people's lifestyles”.

It implies a dramatic shift in how customers are perceived. The customer is no longer an anonymous receiver with standard needs, but a co-designer of value (von Hippel 1986; Normann 2001). Since the interception of user-centred approach by computer interface researchers in the 1970s it has spread to design in general (Norman & Draper 1986).

New design approaches seek to empower users as co-designers who can propose and generate design alternatives themselves. In this view, the companies and designers merely provide a platform for users to express themselves (Sanders 2002). Needs are taken less for granted and contextual studies (Visser et al. 2005) seek to uncover the everyday circumstances that frame the value of products.

Experiences

One way to approach user innovation is to consider the 'experiences' of users. According to Pine and Gilmore (1999) products can be placed on a continuum from undifferentiated (i.e. commodified) to highly differentiated. Consumers who face fairly similar offerings will differentiate the offerings at higher levels. Proceeding to the next stage requires business almost to give away products at the more commodified level.

Just as services build upon goods, so experiences build upon services. In the hierarchy of value – which shares many commonalities with Maslow's “Pyramid of Needs” – experiences are a superior offering, because they not only offer the advantages of services, but also are memorable and personal. Experience is a dynamic, complex and subjective phenomenon. It relates to the 'look and feel' of an artefact, how it is useful in a user's life and the emotions that it evokes (Buchenau & Suri 2000).

The impact of the collective orientation for value is so omnipotent in society, that it shapes the economy; Pine and Gilmore argue that the affluent countries are entering the experience economy, because services have been commoditised. Verganti (2008) proposes a design strategy which aims at radically changing the emotional and symbolic contents of products and says that new levels of value for users can be created through radical changes to products' meaning and language.

The Experience Economy

In the long view the economy is making a shift from material/industrial production to immaterial/cultural production. More and more cutting-edge commerce in the future will involve the marketing of a vast array of cultural experiences rather than just traditional, industrial-based goods and services. Rifkin (2000, p.5) writes that *“concepts, ideas, and images – not things – are the real items of value in the new economy”*. Decisions are made on the grounds of emotional instead of rational thinking, and future products will have to appeal to our hearts, not our heads. Jensen (1999) calls it the “dream society”.

Pink (2005) further elaborates the skills needed in the “New World”. He calls these skills “High Concept” and “High Touch”:

> *“High Concept involves the capacity to detect patterns and opportunities, create artistic and emotional beauty, craft a satisfying narrative, and combine*

seemingly unrelated ideas into something new. High Touch involves the ability to empathize with others, understand the subtleties of human interaction, find joy in one's self and to elicit in others, stretch beyond the quotidian in pursuit of purpose and meaning". (Pink 2005, p.9)

Many companies have already entered the era of the experience economy. They aspire to the values of consumers by making simple, sense-making or open standards. They revitalize long-forgotten brands and capture our imaginations with stories about the 'good old days' or claim to meet the highest standards of social and environmental responsibility to honour the noble values of their customers and employees.

Activities

Another approach to user innovation is to consider activities. Design guru Tom Kelley (2001) describes how IDEO is opening up for valuable user innovation by looking at products and people in motion. Beforehand there was a tendency to be either technology-determined or people-focused, but the two are intrinsically intertwined. By looking at the two in motion and the actions that tie them together, you not only get the best of the two, but also unveil a whole new dimension.

Kelley recommends that designers study products and people in motion and the "doings" - or practices - that tie them together. The claim is that the next level of design transcends the narrow focus on products and/or users, and focuses on the ensembles of activities that tie them together in meaningful entities, also called "practices".

Kelley emphasizes the importance of looking at actions and tell the story of a complete fishing gear box that enables the reproduction of "going fishing" across generations. The fishing gear box contains everything needed for the practice, and comes with easy instructions on how to perform it. The conclusion is that product and technology-oriented innovation do not produce create breakthrough value, but innovation in activities has this capacity.

"Focusing consumer research on the activity that they are trying to accomplish with the product can lead to surprising innovations that are grounded in their daily lives." (Kumar & Whitney 2007, p.49)

4.3 SUSTAINABLE INNOVATION

While the user-oriented approach continues to evolve and spread in consumer markets, it is also being complemented by a much broader movement towards sustainability. The main concern is that modern society is facing a number of pressing challenges. The climate is changing due to human activity and may soon pass critical tipping points with unknown consequences. At the same time, billions of people in India and China are trying to work their way out of poverty and demand a resource-intensive lifestyle like the industrialized countries have practised for decades. The majority of the world's population live in poverty and they are likely to be further impoverished by future climate change.

The industrial world is also facing grave environmental and social problems. Pollution is widespread and the social sector does not meet the challenges in health care, child care, isolation of elderly people, public education or inner city.

A common characteristic is that these questions are complex and ambiguous in nature. Often they are interrelated and likely to have unfortunate, adverse effects (Burns et al. 2006). Many believe that the challenges can-

not be solved within the current modus operandi. In fact the cause of the challenges may be the current system itself, so the solutions cannot be found within it (Manzini 2005). To deal with the problems, it is necessary to transcend the industrial world-view and develop a new set of values, approaches, tools, research, partnerships and solutions (Green 2007).

The world we have made, as a result of the level of thinking we have done this far, creates problems that we cannot solve at the same level at which we created them

- Albert Einstein

A new mission

The new world-view is having a profound impact on business and markets through a number of convergent forces. Consumers and the wider society expect companies to be socially responsible and take leadership in value-based innovation with regard to sustainability, quality of life, social equality, etc. Media and pressure groups discuss companies' values and actions in public, and investment firms demand that ethical standards be met.

A new paradigm for conducting successful business is emerging. Long-term growth is not achieved by focusing narrowly on the profits. An increasing understanding and awareness about the interconnectedness of business, social problems, nature, health and people's quality of life – plus a mandate from consumers and politicians to act on it – urges companies to take a broader view.

To deal with these complex matters companies must think in the larger context. They must look beyond the individual product and consumer, and look at large networks of people, and what pulls them together. It implies that designers and companies must look beyond their narrowly defined business areas and collaborate with a wider network of local authorities, the voluntary sector, communities and private companies to bring about relevant, fundamental changes. To enrol the stakeholders they need to engage in dialogue and show initiative by exploring future innovation opportunities and building common visions.

The paradigm shift implies that innovation - and the future - is democratized across a wide range of actors:

> *"Different stakeholders are involved from the public sector, the business world (local and international companies), academia and NGOs, in addition to citizens and users." (Green 2007, p.46).*

Kanter (2008) found that organisations *"more readily think about the meaning of what they do in terms of the wider world"* and go to great lengths to involve all affected parties, i.e. civic, public and private stakeholders, to develope a shared, multi-perspective understanding of all the related issues and desires.

It is not the first time such questions make headlines and it has been fashionable before to talk about values, but there was little behind the talk. However, this time executives and politicians are willing to accept short-term economic cost for the common good. This change is important, because there have been several moments in history in which engaged groups of professionals proposed more holistic solutions, which were nevertheless rejected due to narrow economic arguments.

Even though sustainable innovation does not provide short-term profit, it should not be considered charity or pure philanthropy. In the process a company develops new skills, knowledge and trustful relations with customers and clients which enable long-term cooperation, attract employees and

can open up new markets (Kanter 1999; Prahalad 2005). Sustainable projects also lead to a highly motivated work-force and the company can build widespread support with customers and local authorities to start new ventures.

Textbox 4.2: Social or sustainable innovation

The World Business Council for Sustainable Development defines 'Sustainable Development' as “a desire for greater equity, quality of life and environmental well being today and for future generations”. It underlines that the social, economic and environmental facets of society are equally important. If a society lacks any of these, it lacks the means to take care of all (Dearing 1999). With reference to this inclusive definition of 'sustainable' we have used the term 'sustainable innovation' to describe recent developments. It is therefore assumed that it also incorporates the domain of social innovation and transformation design, which is widely discussed (Morelli 2007).

New solutions

The current challenges is to a large extent systemic, but cannot be resolved within the dysfunctional system. The realization that 'progress' will not automatically solve all problems, and that politicians and executives lack the will and ability to instigate necessary changes, suggests that a new approach is needed.

Manzini (2005) proposes that the challenges should be addressed through micro-transformations by billions of people, in which micro-scale interventions accumulate over time and have a profound effect on a macro-scale. For micro-scale interventions to take place, people must be empowered to take action. This can be done by completely circumventing the current system and developing alternative, localized relations between people and communities, fuelled by their own collective power and enthusiasm (Steffen 2006),or by using large corporations and the whole industrial complex as a tool for greater efficiency and a resource generator to give people the means to improve their lives (Kanter 2008; Dearing 1999). Businesses and public services are simply considered to be a supportive foundation which people can put to use creatively in addressing their own challenges and enabling them to live sustainable lives. The main point is to empower people to deal with the challenges in their families and communities. It is all about building capacity, not dependency (Manzini 2005).

	Technology	**Market**	**User**	**Sustainable**
Period	1970s	1980s	1990s	2000s
Driver	Performance	Consumption	Experience	Transformation
Keywords	Product Functionality Hardware	Segmentation Trends Lifestyle	Emotions Aesthetics Activities	Network Sense-making Values

Table 4.1: Overview of innovation epochs.

4.4 REFLECTION

Increasing complexity

Modern challenges put the pressure on organisations. The demand for radical innovation requires organisations to stretch themselves to their limits to explore new opportunities. Looking at innovation outside the core business, or in new emerging markets, inherently involves a high degree of uncertainty and risk. Furthermore, organisations have to be quick to respond, so there is no time to develop a thorough understanding. They must proceed with the innovation process on a fragmentary and questionable foundation. Open innovation makes it possible to respond faster, but also requires efforts to be coordinated with external technology partners, adding another layer of complexity to the internal research and development.

Innovating for users is also a demanding objective. It requires an in-depth understanding of what 'makes sense' to people and how they organise their lives. This kind of information is difficult to articulate and resides, to a large extent, in the unconscious, taken-for-granted domain of human cognition (Suri 2005). Involving users in development, and using multi-disciplinary teams to interpret and envision user contexts, enhances the relevance of innovation significantly. However, the dispersed and tacit nature of knowledge, and the number of disciplines and users involved, also increases the complexity and makes it difficult to structure projects.

Relevant knowledge for sustainable innovation is likewise dispersed and difficult to handle because it involves a whole network of individuals and organisations. There exist methods for mapping and visualizing this type of complexity (Morelli 2006), but it requires a new dimension of competence in the innovation team, plus involvement of the stakeholders. However, the most demanding challenge in relation to sustainable innovation is probably to share perspectives and negotiate a common solution for the benefit of all stakeholders. The making of a vision may be a controversial political process which touches on the deepest beliefs and emotions of the parties involved – and the subsequent translation into a concrete solution is often ambiguous.

Unstructured, fuzzy and wicked problems

Many of the complexities now being experienced in modern organisations are present in policy making, and have been described as “wicked” problems (Rittel & Webber 1973). They are characterised by stakeholders having radically different perspectives on the problem, such that the solution depends on how the problem is framed. Every solution proposed reveals new aspects of the challenge and the problem cannot be understood without knowing the context. In fact, you may not understand the problem until a solution has been developed. There may be zero or many solutions to a given problem, but there are also no definitive solutions, so projects either stop when resources run out or when a 'good enough' solution is found (Conklin 2005).

Kolkman (2005) views a problem space in three dimensions: system, knowledge and society. The system encompasses the complexity of both the natural and human environment. Knowledge about the system is created by developing models which can explain the observations in the system. It follows that the better a model explains the system, the more structured the problem space is. Finally, there are the individual values, group norms and beliefs of all the involved parties in the project. The problem is 'unstructured', 'fuzzy' or 'wicked' when the combined complexity, uncertainty

and ambiguity exceed a certain level. Modern challenges score high points on all three dimensions, so it may be concluded that they are highly fuzzy.

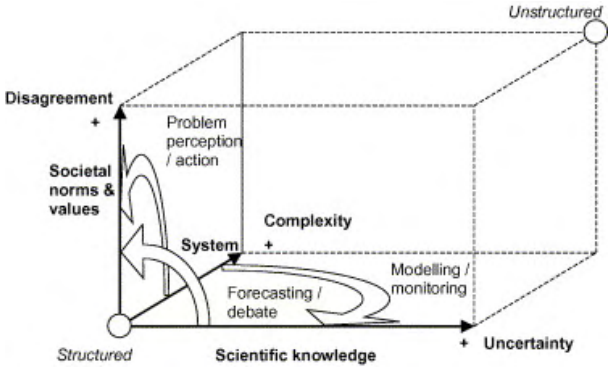

Figure 4.2: The three dimensions of fuzzy problems. (Kolkman et al. 2005, p.327)

Effect on design and foresight

The fuzzy problems is not just a business hype, but are very real for innovation teams (Conklin et al. 2007). Design agencies are involved in projects that are larger, more complex and multidisciplinary. Instead of fixing problems, they take part in the identification of challenges and must master unframed problems. Leading design consultancies report that their client projects are increasingly “fuzzy” and they need to work and navigate in new ways because the paths are not known in advance (Friis 2005).

Design assignments are increasingly complex because clients are looking for radical innovation outside their core business, which entails difficulties in defining an area of exploration, how to get there, and the impact of future technology. Weiss (2002, p.34), from the design consultancy IDEO, writes that *“instead of asking the consultant to 'design this new widget for me,' where the widget is already identified, a client might ask to develop a vision of the future for their products so that they can plan and guide continued innovation efforts.”*

In the field of foresight complexities are also discussed. Daheim (2006) speculates that a new “context-based and open” paradigm is emerging. Herein, the assumption is that future contexts and markets can be shaped in an open dialogue. Research director Alex Soojung-Kim Pang (2010, p.5) from the Institute for the Future suggest that we proceed to the next level of thinking about the future:

> *“A brand-new field that concerned itself with the future - call it Future 2.0 for simplicity's sake - would have four notable features. It would be designed to deal with problems characterized by great complexity, contingency, uncertainty and urgency - properties shared by the critical problems of the 21st century.”*

A new paradigm

There is little doubt that modern challenges are increasingly complex, but there is a bigger story to be told: the nature of complexity takes different forms depending on the world-view.

Traditionally, innovation and business studies are based on a rational system theoretical paradigm, in which complexity arises as a result of interaction between elements. The more elements or the longer the time-frame, the larger the number of possible interactions and complexity. Within this paradigm, the reduction of complexity takes form as a search for patterns (Allee 2003).

However, a social constructivist world-view does not consider people, organisations, systems or technologies as simple elements, but investigates

them as sophisticated actors which, in union, construct identities and meanings. The complexity arises from different perspectives and interpretations of the actors' interests, roles, values and powers (Bijker 1995). Reduction of complexity is not the main issue, but rather to make sense and develop an integrated understanding.

The relevance of each of these paradigms is directly related to the type of questions being asked. For an opportunistic exploration of innovation opportunities, a system theoretical paradigm which takes the elements for granted suffices in most cases. However, when the intention is to empower users, reduce consumption, improve health and quality of life, then a more open-minded and constructive approach is needed to fully understand the issue at hand and to envision effective solutions.

It follows that the general turn towards value-oriented user- and sustainable innovation, favours the social constructivist paradigm and that complexity may increasingly manifest as multiple perspectives and interpretations with a high level of ambiguity, rather than a rational system with uncertainties.

Innovation versus transformation

In a bigger perspective it seems like the innovation paradigm is being replaced by a transformation paradigm, because the drive for constant innovation is replaced by long-term collaboration with stakeholders based on shared visions. In particular, if the in-depth know-how implicit in a certain solution is not easily acquired by another company, it can undermine the competitive principle on which the innovation paradigm is based. New radical innovation may also be disruptive for the natural growth and adaptation of new solutions, and can be considered a threat to the carefully orchestrated configuration negotiated between the stakeholders. Of course, there is also a need for adapting to new circumstances in relation to social change, but radical innovation is not a goal in itself. Growth and commitment are more important.

5 INNOVATIVE CAPABILITY

In the previous chapter it has been argued that innovation is an important aspect of modern organisations. We will now investigate how innovative capability can be improved by a number of initiatives which relate to the internal structures, processes and learning of an organisation.

5.1 LIVING ORGANISATION

Ashby (1956) states that an organisation's internal complexity should match the variety and complexity of the environment in order to deal with external challenges. It follows that an organisation must be agile and alert to survive in a volatile climate. In the following section we will look into how organisational structure influences an organisation's ability to be agile and alert.

Stage-gate process

When innovation takes place within a frame which is narrowly defined - for example if the context, market, user and technology is determined - then the complexity is relatively low and the main challenge is to drive innovation through to the market as fast and efficiently as possible. In this situation relevant information is readily accessible and predictable, so extensive planning can optimize the process towards the final goal and an organisation can function like a machine with clearly defined roles and processes.

Within this context the innovation processes are mainly tools for rationalizing and controlling the innovation. They are typically understood as a linear process in which technical, market and user aspects of a new offering are gradually defined. The processes are often modelled after a stage-gate principle in which distinct project phases are executed in a serial sequence of single ideation elements. (Cooper 2001).

The initial step is typically that a strategist envisions an optimal way ahead, based on a search among a number of options. Once the direction has been decided, the rest is merely a question of implementation through action. It is assumed that there are clear intentions and full understanding throughout the organisation, and that the people involved implement the strategy in a reasonable manner (van der Heijden 1996). For further efficiency, the innovation process may consist of several parallel streams as depicted in models of 'concurrent product development' (Cunha & Gomes 2003).

Vision leadership

However, for many organisations it is not possible to plan ahead. If markets are volatile or a new territory is being explored, then it is impossible to predict beforehand the type of challenges that will appear in the innovation process. Making a fixed plan may drive the process through, but the outcome is likely to be unsuccessful. Another problem is that relevant information is dispersed in a company by the frontline workers, and embedded in a concrete context, so it is impossible for anyone to achieve an overview. The management challenge is to allow the organisation to respond quickly and creatively to opportunities wherever they appear, and yet have those dis-

persed actions add up to a unified strategy. A survey by Kanter (2008, p.44) found:

> *"Employees once acted mainly according to rules and decisions handed down to them, but they now draw heavily on their shared understanding of mission and on a set of tools available everywhere at once."*

To be agile and adapt to changing circumstances an organisation must function as a living system, which consists of multiple self-aware entities that act more or less autonomously (Allee 2003), so they are able to adapt to specific circumstances, but also share the common objective of the survival of the total organism. The solution is to develop a vision and a culture, so that coherency may arise more spontaneously across an organisation (Khurana & Rosenthal 1998; Kanter 2008).

A shared vision builds consensus in an organisation and provides direction and a framework for action which allows for some adaptation to the specific circumstances. It holds together a loosely-coupled organisation and promotes the integration of the whole organisation (Orton & Weick 1990). The shared vision may be framed as a future vision; Weiss (2002, p.34) reports, for example, that companies often ask design consultancies to *"develop a vision of the future for our products so that we can plan and guide continued innovation efforts".*

Bottom-up

Conventional business management suggests the innovation process is framed by the strategy setting of the company, and that foresight goes prior to the strategy setting. However these models only work in an organisational environment in which centralised strategic market information is the key driver for innovation, as opposed to a modern organisational environment in which companies have to behave like adaptive living systems and explore opportunities beyond current markets.

A top-down strategic approach may in fact work out as a straight-jacket that prevents new business areas from prospering (Munnecke & van der Lugt 2006; Kyffin & Gardien 2009). In order for the company to be truly agile, the strategy setting also has to be an ongoing process. Otherwise it will not be able to pursue new business opportunities as they emerge.

Design thinking plays an important role in enabling such pragmatic bottom-up approaches. The success of design thinking, and methods to drive user-oriented innovation and facilitate complex projects in the intersection of eth-

Textbox 5.1: Visions make sense

Being able to think about the future is one of the main characteristics that separates the human brain from other animals. Visions are integral elements of how humans make sense of the world. Ingvar (1985) coined the term 'memories of the future' and wrote:

> *"Our serial programs and concepts of the future may be used as templates with which the input is compared. If there is a correspondence between the two, the input is understood, its "meaning" is perceived." (Ingvar 1985, p.128)*

Visionary people who formulate ideas of the future better recognise signs related to those ideas. Alternatively, the mind tends to shut down to new ideas.

Self-fulfilling

Making visions of the future can in itself drive change and prove to be self-fulfilling by setting a level of expectation that is shared by all. For example, the performance of micro-chips has doubled every 2 years since Intel co-founder Moore predicted this trend in 1965.

"If you can dream it, you can do it."
(Walt Disney)

nography, business and technology, has shown the power of such a design approach and is now broadly being considered a viable road ahead (C. Burns et al. 2006). Naturally, it is not only designers that can use “design thinking”, but it is being freely used by ethnographers, entrepreneurs, technicians, activists, etc., who contributed in the first place with concepts and methods for the evolution of the design field.

	Bottom-up	**Top-down**
Level of analysis	Micro-level 1) User-context, lifestyle, behaviour, values, dreams. 2) Enabling technologies and changing markets.	Macro/global Political, environmental, social, technological, economic and demographical factors.
Type of knowledge	Tacit and emerging	Quantitative
Analysis	Seed/context	Trend-based
Type of innovation	Radical	Incremental
Orientation	Solution- and action-oriented	Decision- and policy-oriented
Main actors	Front-line workers in skunk-works and R&D labs.	Top managers and the board.

Table 5.1: Two different approaches to innovation

5.2 KNOWLEDGE RESOURCES

The potential for an organisation to generate competitive advantage on the basis of its knowledge assets is widely recognized (Pemberton & Stonehouse 2000). The level of conceptual knowledge is closely related to an organisation's level of innovation (Wiig 1993). The greater the depth and diversity of the conceptual knowledge, the greater ithe ability to intuitively create associations between different contexts and information that lead to new insights and radical innovation.

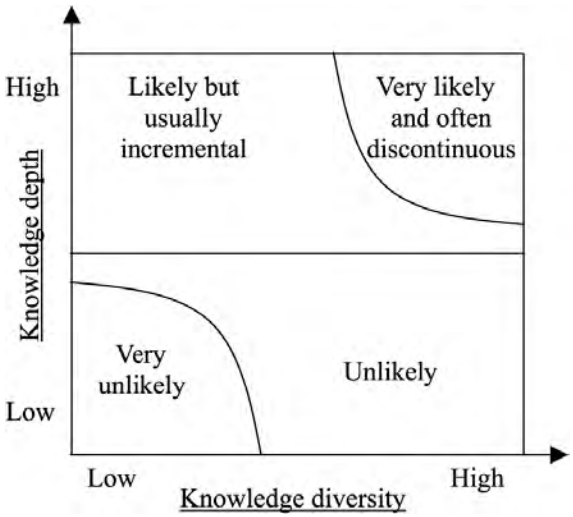

Figure 5.1: The nominal innovation probability space (Sousa 2006).

A repertory of mental models

Mental models are naturally occurring cognitive representations of our external reality. They comprise our paradigms, values, beliefs and assumptions, and constitute a foundation for how we perceive and interpret the world around us, as well as our ability to envision alternative realities. Men-

tal models are the building blocks for creating, building, sharing, storage and management of knowledge. When people have new experiences, the information is assembled into a mental model which makes sense of the phenomenon. The model then becomes a framework for future interpretations and behaviour in relation to the particular phenomenon. Essentially, people think and act through mental models. Without mental models life would be a nonsensical sensory bombardment.

In organisations the mental models are essential for individuals and teams to share knowledge and build a common knowledge base. They constitute the basic vocabulary in a conversation about alternatives. Johnson (2008, p.85) writes, *"the difference between effective and ineffective leaders is their mental models or meaning structures, the way they view and deal with their world."* De Geus (1988, p.70) also emphasizes the link between mental models and the performance of organisations by stating that institutional learning *"is the process whereby management teams change their shared mental models of their company, their markets, and their competitors."* Other authors draw attention to the mental models' role as a facilitator of learning. For example, Davison & Blackman (2005, p.410) argue that the diversity of mental models sets the limits for *"the scope, the type and the acceptance of information that can be assimilated and interpreted by the team, thereby acting as the delimiters of new knowledge within and between teams"*

The aim is therefore to broaden and diversify the repertory of mental models from which one may draw associations and ideas. Chermack & van der Merwe (2003, p.448) elaborate by saying that the challenge is *"to reveal these assumptions and mental models, individuals interpret and construct meaning, or more precisely, re-interpret and re-construct meaning once their assumptions have been revealed to them."* It follows that in the pursuit of knowledge about alternative innovation opportunities, the objective is not directly to envision concrete proposals for innovation. The objective is rather to construct mental models of the possible alternative contexts, developments and factors which influence innovation opportunities. For this purpose the organisation must be geared for 'learning', to facilitate the creation of a shared collective knowledge base to enhance its ability to make sense of the internal and external environment.

Management should therefore encourage discussion and provocations which may reveal relevant dilemmas and factors for understanding the field under investigation. In this sense the broadening means that learning extends established cognitive capability into new domains, while the diversification adds depth and complexity to current mental models.

5.3 LEARNING BY EXPERIMENTATION

Learning is about developing knowledge, but in order to discuss how learning is best achieved, we first need to consider the nature of the knowledge that is relevant for strengthening innovative capabilities. The modern agenda of user and social innovation implies that relevant knowledge is not easily-accessible, objective and generalisable information, but tacit, contextual and subjective insights.

The ability to learn faster than your competitors may be the only sustainable competitive advantage

- A. P. De Geus (1988)

Tacit, contextual and heuristic.
These insights are difficult to extract and manage. For example, are insights about the user context, the subtle interaction with technology, and what

makes sense to people, first and foremost embedded within people themselves and only secondly in frontline workers, such as the marketing people, the developers, the engineers, etc. Another characteristic of innovation knowledge is that it is highly hypothetical and ambiguous. The unique purpose of design and innovation, which sets it apart from natural sciences and the humanities, is the conception and realization of new things. While the traditional sciences are concerned with how things are, design is concerned with how things ought to be (Simon 1988). Cross (1982, p.221) says about design that it *"has its own distinct 'things to know, ways of knowing them, and ways of finding out about them.'"* which also is valid for innovation. The search for new innovation opportunities is a heuristic exercise in which experimentation can efficiently produce an approximate and suitable understanding of the possible alternatives.

Best practice
Coughlan & Prokopoff (2004, p.189) found that three tools, in particular, are effective for innovation: contextual observation, human-centred frameworks, and rapid prototyping. The same elements are repeated by Green (2007, p.48) who suggests that *"future innovation will be driven by human-focused insights and inputs, half-realized prototypes and designer/user participation, manifested through an iterative process of creativity and refinement."*

The power of experiments

Experimentation is a powerful learning style for developing new relevant knowledge (Sousa 2006). Yeung (1999, p.65) found that different organisational learning styles lead to different levels of performance and that *"experimentation was the only learning style that significantly differentiated the high and low performers".* Experimental learning has also speeded up the process of institutional learning for strategy making at Shell (De Geus 1988). In the context of design and innovation, experimentation often takes the form of prototyping. Kelley (2001, p.37) has found that *"when the project*

Textbox 5.2: Mental models, visions and radical concepts

Mental models can take many different forms. It can be a prototype or a computer model.

> *"Mental models are a means by which organisations and individuals create and share meaning, thereby enabling a common understanding and the development of knowledge." (Davison & Blackman 2005, p.410)*

Successful consultants use themselves as transitional objects which collect information from various sources and present tentative proposals. This process goes through a number of iterations in which an improved, shared mental model is developed (De Geus 1988).

Not a solution
In the context of transformative learning the outcome is not to be considered as an actual proposal but more as a medium for conversation. A radical concept represents a vision, an interpretative scheme, or a mental model of a given context (Hill & Levenhagen 1995).

When making experiments, it is not the aim with the prototypes to suggest a concrete offering, but to use the prototype to provoke a conversation which may reveal new insights - i.e. learning - about the underlying variables, mental models and assumptions which determine the landscape of alternative innovation opportunities.

is especially complex, prototyping is a way of making progress when the challenges seem insurmountable."

Knowledge transformation

Experimentation and the making of prototypes or radical concepts is particularly suited for learning about innovation-relevant knowledge because the experimentation process facilitates the transformation of tacit, contextual and dispersed knowledge into a shared organisational asset (Boisot 1995).

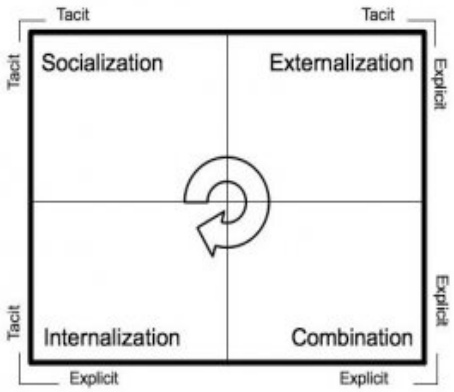

Figure 5.2: The SECI process. (Nonaka 1995)

The process is described in detail by Nonaka & Takeuchi (1995), who divide the process into four modes of knowledge creation in organisations which have to interact with each other to form a knowledge spiral creating knowledge.

1. Socialization: This is the process of creating shared, tacit and sympathized knowledge though shared experiences. E.g., by spending time together.
2. Externalization: When tacit knowledge is articulated it is crystallized as explicit knowledge, allowing others to share it. Concept creation in design is an example of such a process.
3. Combination: The process of linking concepts creates more complicated and systemic sets of explicit knowledge. The breaking down of a vision into operational concepts creates systemic knowledge.
4. Internalization: Explicit, shared knowledge is internalized by means of training or other activities that involve "learning by doing". Reading a manual is also an example of internalization.

The process may be repeated continuously to gradually expand the knowledge of an organisation.

Prototypes and mediating artefacts.

Prototypes play a central role as drivers of the learning process. They bring diverse people into conversation and act as 'boundary objects' (Star 1989) which are of interest to each profession involved, but are viewed or used differently by each one. Around these objects, their different assumptions are clarified and the combination of viewpoints may lead to further knowledge creation.

Prototypes are easily communicated and people intuitively understand them. In particular, user-oriented concepts have to be experienced in context to be fully appreciated. Prototypes and use scenarios make it possible to submerge oneself into a new context (Rameckers & Un 2007).

Complex systems must be understood from all perspectives to be conceived fully. A working prototype may act as a reference point and make it

possible to see a proposal from various view points to gain an integrated understanding of the total system.

Transformative learning

Argyris (1985) suggests that an action may lead to different levels of learning. Most commonly actions are performed to achieve an intended consequence. In case of a mismatch, the first response is to resolve the conflict by searching for a different action strategy within the same governing variable (i.e. mental model). The change only concerns the action and is called single-loop learning. See Figure 5.3.

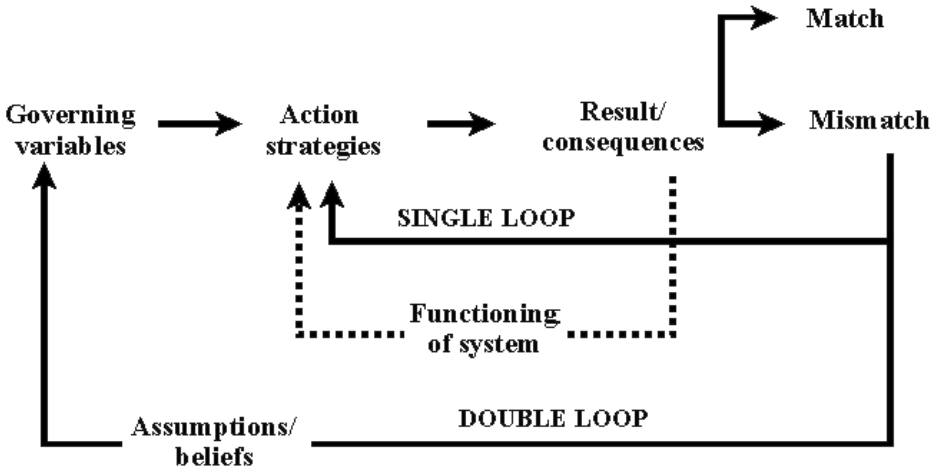

Figure 5.3: Single- and double-loop learning (Adapted from (Argyris et al. 1985))

Another reaction to a mismatch can be that the governing values are examined and transformed. Based on an improved set of governing variables, a new action strategy is conceived. This process is called 'double loop learning'.

However, actions may also be deliberately undertaken with the aim of inquiry and to possibly transform mental models. In the field of design research, experiments are commonly executed with prototypes to learn about users – not to test the prototype itself (Coughlan & Prokopoff 2004). Schön (1983, p.145) explains: *"Exploratory experiment is the probing, playful activity by which we get a feel for things. It succeeds when it leads to the discovery of something there."* The experiments open up for an appreciative inquiry in which perspectives, values and assumptions are openly shared and transformed.

> *"Experimentation can therefore help firms improve their position in the innovation probability space by increasing knowledge depth through learning by hypothesis-testing experimentation and increasing knowledge diversity through learning by explorative experimentation." (Sousa 2006, p.402)*

Scaffolding / Gradual improvement.
In the development of mental models it is important to consider that mental models are inter-connected and that the development of new models is constructed on the basis of previous models. At any stage there is a 'zone of proximal development' (Vygotsky 1978) which delimits the current ability to expand the mental models. A learning cycle may gradually expand the network by adding new structures around the existing knowledge. A continuous learning process is therefore better suited to building knowledge than a single project, which has a finite ability to expand the limits of knowledge.

Multidisciplinary teams

Multi-disciplinary project teams may in particular be conductive to the learning processes described above. Diverse teams increase the exposure to different thinking styles, the number of possible associations and the probability of the emergence of new insights. When worlds collide new alternatives are found (Darsø 2001). Wang (2009, p.93) say that empirical research show that *"organizational diversity promotes exploratory learning primarily featured by individual, generative and divergent"*, so diverse groups generate more creative ideas and alternatives than non-diverse groups. However, learning also takes place outside formal settings. Heijden (1996) writes that informal conversations in corridors and lunch rooms are much more likely to be conductive for new learning and provocative perspectives, then planned meetings and workshops.

5.4 LEARNING CULTURE

The culture of an organisation is all-important for learning to take place. Brown (1997, p.1) notes that for the most radical innovators who constantly re-invent themselves, *"the ability to change rapidly and continuously... is not only a core competence, it is also at the heart of their cultures."*

In order for these modes of knowledge creation to take place, the organisation should provide a setting with the following enabling conditions: intention, autonomy, creative chaos, redundancy and requisite variety (Nonaka & Takeuchi 1995). Martins & Terblanche (2003) cite similar values like flexibility, freedom and cooperative teamwork as conductive to innovation. One way to achieve these goals is to ensure that an organisation have permeable boundaries, so that knowledge and people are allowed to flow through the organisation to bring new perspectives into the learning and knowledge-building process (Sousa 2006).

The environment has to be conductive to exploring and keeping ideas alive through a flexible and open-minded attitude (Hargadon & Sutton 2000). It must encourage people to think differently and promote provocative viewpoints which help to examine issues from multiple angles and redefine them through a multi-faceted range of inputs. Furthermore, individuals must be empowered to experiment and rewarded for risk-taking. Failure should be considered an opportunity for learning, not an occasion for blaming anyone. Kelley (2001, p.36) has found that *"a playful, iterative approach to problems is one of the foundations of our culture of prototyping."*

'Reflexivity' is an essential part of learning, and the organisation should be prepared to challenge and re-define goals and paradigms for the organisation and its environment. The link between learning and creativity is well-established. West (1997, p.135) writes that *"innovation involves risk-taking and requires courage, but 'business as usual' no longer works. Organisations consequently must develop a deep reflexivity in their approaches to work."* Reflexivity, as a part of learning, has a positive effect on a number of aspects which enhance the organisation capability to handle fuzzy problems and come up with new innovations. West continues:

> *"Organisations and teams which practice reflexivity and are prepared to continually challenge and redefine their organisational roles, goals and paradigms, via processes of innovation, develop a more comprehensive and penetrating intellectual representation of their role. They better anticipate and manage problems, and they deal with conflict as a valuable process asset within the organisation, encouraging effectiveness, growth and development. The most reflexive organisations are those within which there is a maelstrom*

of activity, debate, argument, innovation and a real sense of involvement of all employees."

5.5 THE INNOVATION ENGINE

According to Baghai (1999) an organisation must manage three innovation horizons to secure its long-term survival. Each of these horizons contain different challenges and levels of external complexity. At one extreme, there is the horizon in which they must think out-of-the-box and envision radical innovation with new levels of value. At the other extreme there is the need for timely and efficient implementation of innovations within a given frame.

The importance of an exploratory culture and approach has previously been emphasized, but great new innovation opportunities do not manifest by themselves. The organisation needs to complement the open-minded, learning-oriented process with a performance-oriented process which can bring selected innovation concepts efficiently to the market. Without an efficient innovation process, resources and time would run out on many innovation initiatives and momentum would be lost among employees and stakeholders. In other words, an organisation needs an 'innovation engine' which links together exploration and exploitation (Sousa 2006).

> *"Adaptive systems that engage in exploration to the exclusion of exploitation are likely to find that they suffer the costs of experimentation without gaining many of its benefits. They exhibit too many undeveloped new ideas and too little distinctive competence. Conversely, systems that engage in exploitation to the exclusion of exploration are likely to find themselves trapped in suboptimal stable equilibria. As a result, maintaining an appropriate balance between exploration and exploitation is a primary factor in system survival and prosperity." (March 1991, p.71)*

Studies also show that strongly shared visions may prevent a team from constructing an accurate picture of their present by failing to recognize the

Textbox 5.3: Innovation labs

In the last decade many innovative market leaders have set up future labs, concept labs, vision labs, etc., to provide radical innovations. The future labs are detached from the main organisation to create an environment that is optimal for innovations.

The main problem with the traditional organisation is that internal cultures and pressures often push efforts toward lower risk, immediate reward, incremental projects. The hierarchy imposes a top-down decision process which suppresses emerging radical innovation that originates with the frontline workers.

The idea of an innovation lab is inspired by the insight that radical innovation often emerges from the frontline workers' tacit, contextual knowledge and daily experimentation. Such experimentation investigates parts in detail without knowing the overall system, and allows out-of-the-box insights to emerge that can lead to radical innovation and a redefinition of previously established frameworks and strategies.

The labs are effectively short-cutting the middle layers of the main organization, so that top managers can interact directly and learn from frontline workers. "The reason is that amongst all of the decisions, those which appear secondary at the moment they are made may later transpire to be as crucial as those thought to be strategic" (Akrich et al. 2002, p.193).

Innovation labs are therefore a practical solution to the dilemma of, on the one hand, having a disciplined and focused core organisation and, on the other hand, leaving space for an open-minded and creative exploration of innovation opportunities. In order to bring about frame-breaking change they have to remain outside existing paradigms and resist corruption by established interests (Rieple et al. 2005, p.51).

Another advantage is that they can easily be cut if the environment stabilizes and exploratory efforts are downgraded.

importance of alternative perspectives (Davison & Blackman 2005). A too early performance mode may therefore raise the risk that the innovations are irrelevant and must be abandoned at a later stage with the loss of all investment. On the other hand, a lengthy learning mode may confuse the visions that are needed to drive new innovations effectively through an organisation, thus causing projects to stagnate and spending to go up.

Emphasis change according to external context

It is therefore important for an organisation to manage the different approaches to innovation and use them appropriately to reduce unnecessary risk. In most literature, the internal organisation is depicted as either one model or the other. For example, in one survey De Geus (1988) was impressed by how successful companies were able to live in harmony with their environments and shift gears in turbulent times, while Tushman & O'Reilly (1996, p.11) write that *"Almost all successful organizations evolve through relatively long periods of incremental change punctuated by environmental shifts and revolutionary change."* Typically, it is said that as external challenges increase, organisations move from instrumental to visionary innovation, and subsequently towards innnovation based on learning.

Considering that organisations should manage several horizons with different levels of complexity, from renewal of current business to exploring emerging opportunities, an organisation should ideally have several models in place simultaneously, i.e. to be ambidextrous (Tushman & O'Reilly 1996). However, the challenge is not only to manage the application and timing of the two different modes of innovation in relation to the concrete complexities encountered in an innovation process or an organisation as a whole. Integrating them in an organisation may be troublesome as they make contradictory demands of the employees.

Each mode requires a different mindset which is difficult to combine in an organisation:

> *"Exploration includes things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation. Exploitation includes such things as refinement, choice, production, efficiency, selection, implementation, execution." (March 1991, p.71).*

The difference may also be described as having an open mind for new perspectives or a focused mind with emphasis on delegation and coordination of activities in an efficient manner for a specific goal.

According to Wang & Rafiq (2009) little is known about how to effectively balance the two cultures. One way is to introduce diversity and shared visions simultaneously, but managing controlled chaos is a difficult task (Quinn 1985). A practical solution may be implemented in different ways. Companies like Google and 3M encourage employees to spend up to 15% of their work time on their own ideas and informal projects (P. Burns 2004). Another solution is to clearly define the mental mode of a project's phases. However, in practice it is difficult to integrate the two different modes in the same person, project, team or organisation. A popular solution is to keep the two modes completely separate in the organisation. Innovation labs are examples of such a division where the exploratory unit is isolated and does not interact directly with the main organisation.

6 THE INNOVATION MAP

As the last step in the process of linking modern challenges with vision projects, we suggest in this chapter a specific understanding of vision projects and the qualities of the outcome, so that the innovative capabilities of an organisation is improved as much as possible.

6.1 THE PURPOSE OF VISION PROJECTS

In the following we briefly outline how vision projects can enhance the innovative capabilities of an organisation. It is proposed that a vision project serves three main objectives: appreciative, instrumental and consensual.

Appreciative

This perspective focuses on a vision project's capacity to be a learning process which builds knowledge about an organisation and its environment. The objective is to create a repertoire of perspectives, interpretations and mental models which broaden and diversify the knowledge.

> *"[The 'Pictures of the Future' initiative at Siemens] represents a knowledge base that is fed by many internal and external sources and is continually expanded." (Volkmar Dimpfl & Frank Krull 2004, p.7)*

The theme is typically a relatively unknown problematic situation in which "you don't know you don't know" (van der Heijden 2004a). It may either be a theme in the far future or in the contextual environment. For such themes there is a high degree of uncertainty concerning its relevance and the ability of an organisation's to influence the future of the theme purposefully. It therefore involves sensitizing, re-framing and making sense on the basis of an open mind, without any a priori intention of shaping or directly benefiting. It seeks to develop an open mind to alternatives and challenge dominant logic and coalitions (Coopey 2004).

In the context of design and innovation the knowledge objective is more specifically to explore alternative innovation opportunities; the radical concepts are mental models of innovation opportunities. Radical concepts act as drivers of a continuous learning circle and seek to provoke and stimulate the exchange of view points.

The "probes" research program at Philips Design is an example of a vision project with emphasis on learning. It explores the frontiers of art and technologies within themes which are not related to the current business divisions of Philips. Clive van Heerden, Senior Director at Philips Design, says:

> *"Such explorations may at first glance appear abstract and unrelated to Philips business, but in fact can provide very valuable input for future activities." (Philips Design 2006)*

Future literacy
The mental map enables organisations to make sense of their environments and envision alternatives. Cohen & Levinthal (1990, p.128) use the term 'absorptive capacity' to describe *"the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends"* and argue that organisations with a high absorptive capacity are more successful in their exploration of innovation opportunities.

Philips has a company-wide program for developing and sharing a mental map which increases the overall 'future literacy':

> *"Within the Philips organization, one way future literacy is being increased is via the Compass Program. Compass is a company-wide initiative that provides a shared mental map vertically within Philips business divisions and across One Philips. 'It provides a common language across the company and offers strong creative insights to drive innovation,' explains Green [Senior Director at Philips Design]." (Philips Design 2006)*

Vision projects as experimentation for learning.
The vision project may be considered part of a larger cycle of a double loop learning process in which mental models are being developed about radical innovation opportunities. The learning loop starts with the formulation of a mental model – or a collection of mental models. This may for example be done with the use of scenario techniques which will be discussed in later chapters. The presentation and sharing of radical concepts are staged to initiate a conversation with employees, stakeholders or the larger public. Their reactions are subsequently evaluated so that the mental models can be modified accordingly. From this point another learning loop may be performed to further develop the mental models.

Instrumental

The instrumental perspective on vision projects argues that it is a solution-oriented process which produces visions that guide decisions and actions in relation to innovation throughout an organisation. The objective is to develop a clear vision with a strong potential for driving high-value innovation.

The boundary to ordinary product development is seamless, but it basically fills the function of identifying an area of opportunity and defining the context of a new offering to such an extent that the level of complexity and uncertainty is within the capability of the development process. It acts as a spring-board for more detailed and specialized planning, such as product, market and technology road-mapping (Phaal et al. 2001).

It typically focuses on the mapping of possible opportunities, threats and interventions in the mid-term horizon within the immediate transactional environment of an organisation.

The instrumental use of foresight is by far the most cited reason for Philips and Siemens to conduct foresight projects. Both corporations emphasize that foresight has a direct impact on their current actions. For example, professor Claus Weyrich from Siemens explains the purpose of their vision projects:

Textbox 6.1: Learning from native people

The Australian Aboriginals were the first to use maps to navigate between opportunities and threats. For many thousands of years their culture has carried information with it in the form of sand drawings, which give an overview of food deposits, hostile tribes and landmarks that could indicate where you were in the bush/desert.

We may also take a lesson from native Indonesian tribes (Saffo 2005). These tribes found their way across oceans by reflecting on large amounts of weak signals in wave patterns, animal life, etc. By having a profound understanding of a complex world, they were able to interpret these signals and find what they were looking for. The same kind of insight must be given to companies so that they, in collaboration with their "early warning team," can make sense of the weak signals which are hidden somewhere in all of the information we have access to in a modern world.

"The pictures of the future are more than just a collection of ideas and visions. They also represent a systematic process that quickly produces market forecasts — as well as anticipating major new trends, identifying the technologies that underlie them, and generating ideas for new business opportunities. And most importantly, this process shows us how to achieve these future goals from our current point in time. In other words, it tells us what we have to do." (Eberl 2002, p.5)

Similarly Stefano Marzano, the Chief Creative Director of Philips Design, elaborates how the vision project drives innovation internally at Philips Design.

"If we together formulate a number of options in advance, we will be more focused and better able to discuss alternatives with each other. We will also be able to derive hypotheses and roadmaps for functionalities, technologies, new materials and capabilities. And, most importantly, we will be able to concentrate our valuable and scarce resources on precisely those projects that have the best chance of success." (Philips Design 2005, p.16)

Consensual

The benefits of a vision project are also derived from the process and its ability to transform the organisation, rather than the outcome itself. A vision project may bring together stakeholders and provide an opportunity for sharing information and perspectives. Through the process a common language is developed and common grounds may be found in a democratic manner. Finding consensus is often a key aspect of value-oriented user and sustainable innovation, but having a common vision is in general essential for leading an organisation. It may even be better to have a faulty vision than no vision at all:

"Whether the initial map is accurate is less important than that there is a map in the first place." (van der Heijden 2004b, p.149)

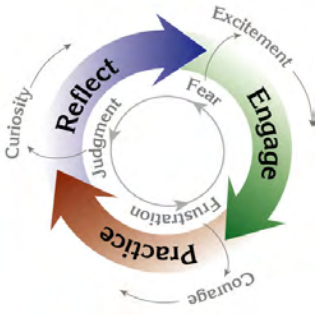

Figure 6.1: The Six Second's Emotional Intelligence Change Model (Freedman 2007).

The experimental nature of vision projects and the radical concepts' role as boundary objects, enable unprecedented capabilities to extract information, ideas and perspectives from a wide range of participants and stakeholders. This may encompass a design department, divisions of a company, business partners and alliances, users and customers, or simply the whole network of stakeholders. The Philips' City-People-Light vision project from 1998, is an example of how an organisation achieved a leading position and trusted collaboration through the development of visions.

"After the project local authorities, departments of transport, architects and urban planners understood that we could 'speak their language', and provide solutions that fit their requirements. Today, we work together with them in developing master plans that deal with the evolution of the city through light, towards a more human-focused future." (Philips Design 2004)

The alignment of expectations and common visions are important in order to engage stakeholders, build momentum and facilitate a smooth introduction.

In value-laden challenges the biggest obstacle to introduction of new innovations and change in general is not always technical or political, but emotional.

However, if visions are built through an inclusive process and people are given the chance to express their negative emotions, like fears, anxieties and frustration, then these feelings may be converted into a supportive attitude of curiosity, excitement and courage – an attitude which undoubtedly makes the introduction of a new innovation much smoother (See Figure 6.1).

Varieties of projects

All three purposes are interlinked. The appreciative aspects provide a foundation for selecting specific visions for instrumental purposes, so that the assumptions, risk and dilemmas of potential visions are drawn into the selection process. The appreciation of different view points is also an important part of consensus building, which may lead to the establishment of a common ground and commitment to 'instrumental' implementation of a particular vision.

Vision projects therefore typically contain elements of all three purposes, but there are also examples of individual projects which are framed with a dominant purpose. The mainly exploratory probes by Philips into decoration on human skin are an example of a mainly appreciative project. Sustainable innovation projects often take a consensus-building approach in which a wide range of stakeholders are included in the process and the main objective is to create a common ground. This was for example the case at the Index 2005 views conference.

In summary, a vision project aims to:

- develop a shared knowledge base about the external environment, and more specifically about radical innovation opportunities.
- provide a range of visions which may be used for management of the innovation process.
- engage stakeholders and create a common vision.

6.2 THE MISSING LINK

What are the characteristics of the outcomes of Philips and Siemens' vision projects? Now that we have investigated the potential application of vision projects and radical concepts, we will turn to the vision portfolios of Philips and Siemens and investigate their characteristics.

The problem

The vision portfolio of Philips shows an impressive scope of future concepts. For example, the 1995 “Vision of the Future” project covered all the major domains of peoples lives. Similarly, Siemens presented in 2004 posters for each business area in which innovation opportunities were integrated into a single overview. In recent years the vision projects have been less comprehensive and there has been a tendency to present future concepts in the context of a specific situation, with a focus on experiences and activities, rather than individual future concepts.

However, it is characteristic that each of the vision projects builds on a single set of assumptions or trends about the alternative context. It follows that a vision project's radical concepts do not represent alternative visions, but describe opportunities within the same fundamental vision. For example, many of the concepts assume the emergence of new technologies, but do not give insight to the threats of other technologies – or the odd case that a technological solution is not needed at all. The same accounts for socio-cultural trends which are not critically evaluated and possible alternatives which are not presented.

There are also examples of similar radical concepts that appear in more than one vision project, but because the background, typically, is vaguely described and only seeks to justify the final concept, it is not possible to

determine if the vision space is exhausted or if the particular concept is in 'fashion' among visionaries.

This type of vision projects is suitable for instrumental purposes which seek to promote a particular vision, but does not provide an overview of an organisation's possibilities for appreciative purposes. As long as only a selected and non-controversial concept is shown, with no alternatives, the conversation cannot take place beyond the concept itself and the assumptions that it embodies. From an appreciative perspective it would at least be interesting to merge and map the outcome of several vision projects based on different assumptions, but no such exercise is presented.

The overall impression is that the vision projects presented do not serve the purpose of “mapping,” but “aim to sell specific versions of the future (Lente & Homburg 2003). The promotion of just one version of the future may make it easier to develop a common vision, but it contradicts two fundamental ambitions of the modern vision work: the democratization of the future and the ability of the organisation to respond to emerging issues in the environment. Furthermore, there is the risk that the vision, for one reason or another, may prove to be unviable or undesirable, so that the organisation is left with no vision at all.

To be fair it must be mentioned that the 'probe' program by Philips Design, is specifically targeted at stimulating conversation beyond the core business of Philips. As such it is a prime example of how vision projects can serve appreciative purposes. However, the probes focus on very specific themes and are not incorporated into a bigger picture, so at present they do not add up to the overview of innovation opportunities that organisations need.

From an appreciative point of view, the lack of a well-founded overview of innovation opportunities makes the current outcome of vision projects appear fragmented and superficial. The outcome is simply not suitable for exploring different innovation opportunities, nor as a foundation for generating a steady stream of radical innovations.

Given the potential of vision projects to develop relevant insights about innovation opportunities, it is disappointing to conclude that the potential is not realized. If the current outcome is used as a foundation for exploring innovation opportunities, it is very likely that it will lead to disappointing results, because it probably does not inform much about the context and background of the innovation opportunities or the alternatives. In consequence vision projects may fail to live up to expectations, thus giving them a bad reputation, so that their potential will never be realized for the benefit of people, business and society. It is therefore of great importance to overcome these shortcomings. This study therefore seeks to develop a methodological framework for vision projects which specifically aims at exploring and mapping innovation opportunities.

However, before we investigate how a methodological framework can be developed, we must specify in more detail the properties the outcome of vision project should have in order to effectively guide an organisation's innovation activities.

6.3 AN INNOVATION MAP

The above analysis finds that contemporary projects do not offer a comprehensive map of innovation opportunities which we learned earlier, in chapter 4, “Modern Challenges,” is highly important for the survival and growth of organisations. Vision projects nevertheless have a unique ability

to create the relevant knowledge, – as seen in chapter 5, “Innovative Capability“ – which unfortunately is not realized in contemporary vision projects.

> *“When you don’t know in advance what the challenges really are, you need several different perspectives and the tools from several different fields to really gain an overview of the entire realm of possibilities.” (Friis 2004, p.7)*

The objective of this study is to improve the outcome of vision projects, so that they may constitute a map of innovation opportunities which can significantly enhance an organisation's capability to produce a steady stream of relevant and radical innovations – hereafter named an “innovation map”.

Essentially, it is the knowledge platform which enables an organisation to master the complexity of the environment without losing its way. In a volatile environment it can serve as a navigational map, providing a point of reference and an understanding of the patterns and significances below the chaotic surface.

Navigational
The map integrates both appreciative and instrumental components into a single, integrated unit. More specifically it should integrate the insights from experimental probes into a complete overview of issues, dilemmas, forces and factor which influence the spectrum of radical innovation opportunities. These insights should provide the context and background for a comprehensive set of compelling visions.

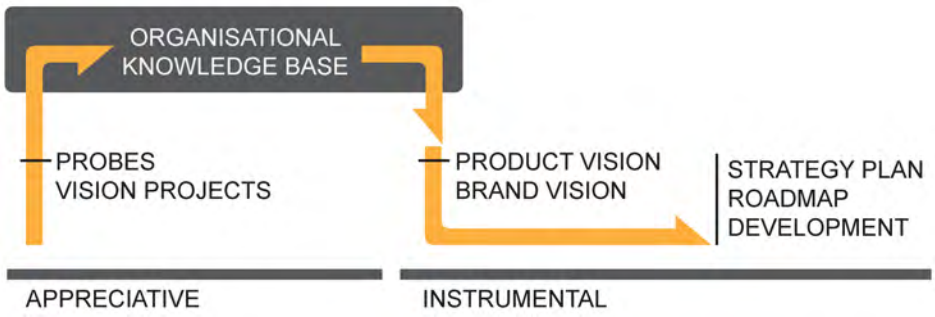

Figure 6.2: Vision projects add to the organisational knowledge base which links appreciative knowledge with instrumental guidance and planning.

The map is open to many different interpretations and perspectives on the external environment of an organisation. It does not include reflections on how particular organisations may fit into the picture in order to make it relevant for a wider scope of potential stakeholders and avoid prematurely closing options off. However, as a shared knowledge base and point of reference for reflections on the external environment, it acts as the backdrop for innovation-related strategic decisions and operational activities across an organisation and all phases of innovation.

More precisely, the map serves as a foundation for selecting and developing visions for a specific organisation. Those visions may subsequently be refined into more detailed strategies, road-maps and other types of planning that are suitable for the particular context and situation of an organisation. The innovation map hereby connects the appreciative probes with the instrumental visions, road-maps and strategies. It may also be used to test – or wind tunnel – visions or plans conceived outside the framework of the map.

The map also provides a frame of reference for making sense of external environments, so that the external 'literacy' is increased and the organisation can react more swiftly to changes. On the basis of the diverse and broad innovation map, the organisation can quickly recognize the significance of emerging issues and identify more appropriate visions to pursue,

effectively enabling organisation to navigate complex and versatile environments.

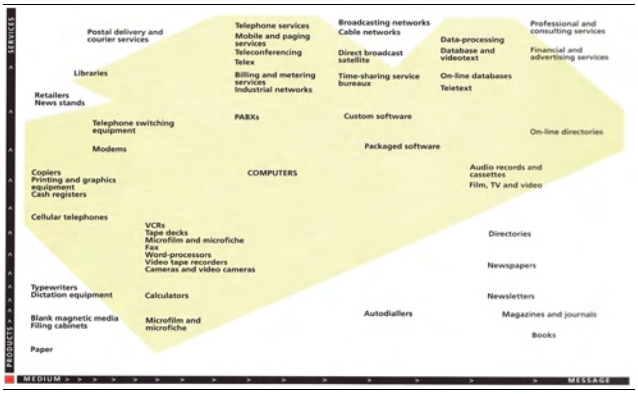

Figure 6.3: Map of the electronic office of the future. (Baker 1993, p.189)

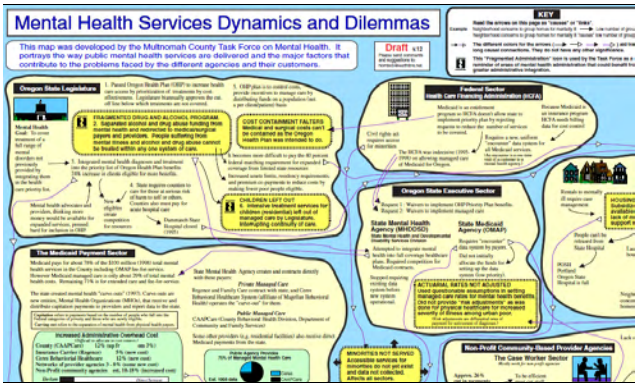

Figure 6.4: Map of dilemmas and perspectives. (Horn 2001)

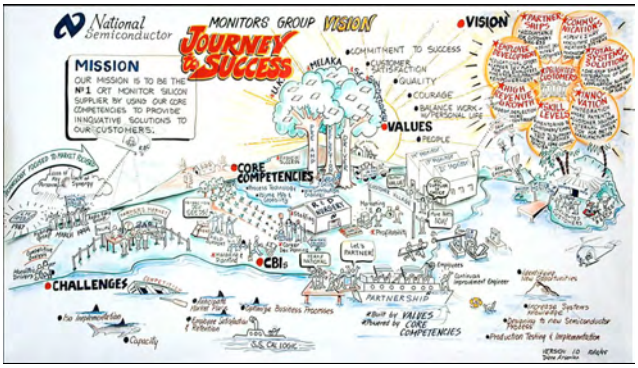

Figure 6.5: Values, challenges and visions in an integrated map. (Sibbet 2006)

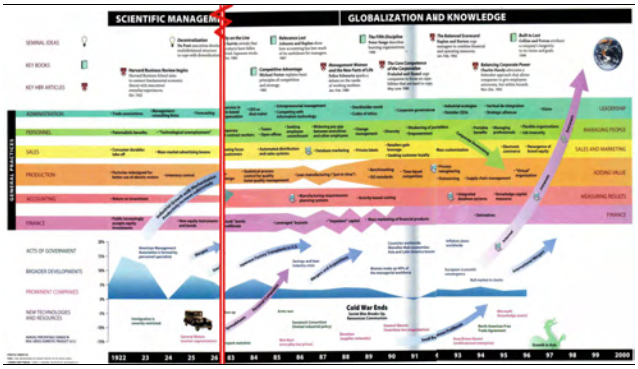

Figure 6.6: An example of a time-line trajectory map. (Sibbet 1997)

Shared

The format is not necessarily a single poster, but given a project context in which it is desirable to share it among team members and stakeholders, rich images can be a formidable tool for conveying possible radical concepts and the plethora of issues and dilemmas that surround them.

> *"At the design innovation consultancy Humantific in New York, they construct challenge maps showing how a client's challenges are interconnected from strategic to tactical. This work takes place before any design activity begins." (Friis 2004, p.34)*

Everyday activities as the analytical unit

Even though an innovation map ideally should be *"multi-period, multi-level, multi-context, multi-actor and multi-disciplinary; if it has to catch reality that is in flight"* (Chakravarthy 2003, p.xv) and scholars dream of a *"boundary-less, systemic, holistic view of the future"* (Heathfield 2006, p.4), we are proposing a less extensive scope for the content of the innovation map.

Resources are limited for vision projects, so efforts must yield a significant contribution to be justified; it is therefore reasonable to focus the content on the aspects which are most important for organisations facing modern challenges. It has already been argued that radical innovation opportunities are central to organisations' survival. But innovation can take many different forms, so we will further argue that 'everyday activities' is a unit of analysis which effectively encompasses the most relevant aspects in relation to modern challenges.

In relation to user innovation, everyday activities are the backdrop for the users needs, expectations and habits. It is in the context of an everyday activity that innovation is a given value. The products and services that businesses offer have no value if they are not relevant in relation to everyday activities. On the other hand, if the products and services are thoroughly integrated in desirable everyday activities, then the business will have a stable market with loyal customers.

Everyday activities also play a central role for sustainable innovation. For example, they account for a large proportion of activities in society and the derived consumption of resources with a direct impact on sustainability. To businesses, everyday activities define markets. By integrating offerings into them, it is possible to offer relevant value which is difficult for competitors to replicate. Everyday activities also define, to a large extent, social relations and quality of life for ordinary people.

Choosing everyday activities as a central analytical unit, is not meant to exclude specific areas of investigation, but serves simply as a guideline for the unfolding of relevant aspects of an innovation map. The key point is that everyday activities link modern challenges with the object of innovation. In other words, innovations may change the everyday and the everyday may efficiently deal with modern challenges.

... innovations may change the everyday and the everyday may efficiently deal with modern challenges

For modern organisations there may be other types of challenges, than the once described in this study. Those challenges may be important in terms of their specific situation and may demand additional investigations into technologies, markets, policy-making, etc. The understanding of everyday innovation opportunities can therefore be considered part of a potentially much larger system of organisational knowledge. However, everyday innovation opportunities are a key area of investigation in a modern innovation paradigm and may suffice for most organisations.

The innovation map is a shared knowledge base in an organisation. It aims to drive innovation in a number of ways. Most importantly the innovation map:

- works as a navigational tool to choose between different visions and radical innovation opportunities.
- makes it easy to filter the constant flow of information and understand the potential impact from weak signals.
- enables organisations to respond quickly and efficiently to changes in the environment.
- acts as a common point of reference for innovation-related activities in an organisation.
- informs decisions on investment in technology and know-how.

6.4 THE CONTENT SPACE

Herbert Simon (1996, p.111) describes the design process as “...courses of action aimed at changing existing situations into preferred ones”. The process has also been described as “running a maze”, but in the context of modern innovation the objective is not to present a single concept, but to generate an overview of innovation opportunities.

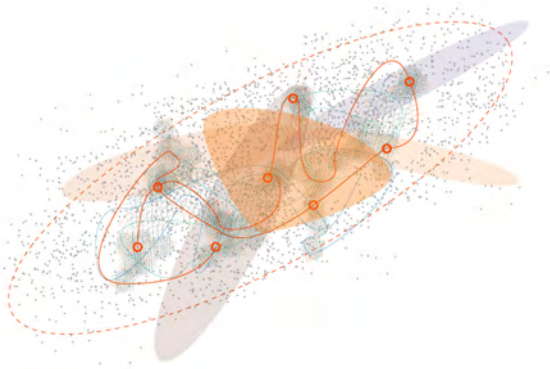

Figure 6.7: Visual representation of a design space (Heape 2007).

Kyffin from Philips Design *"sees innovation as a network of options,"* because forcing *"business priorities too early onto innovations confuses the issue rather than clarifies it."* (Green 2007, p.29)

It is a controversial view, because the dominate model is an "innovation funnel" that filters ideas and gradually reduces the alternatives to a small number of feasible ideas. The main challenge is therefore to produce a single optimized design and not the management of a space of ideas. The different views originate from the type of challenges they seek to address. The traditional engineering design challenge is about solving a concrete problem, while modern challenges are more about openly exploring opportunities.

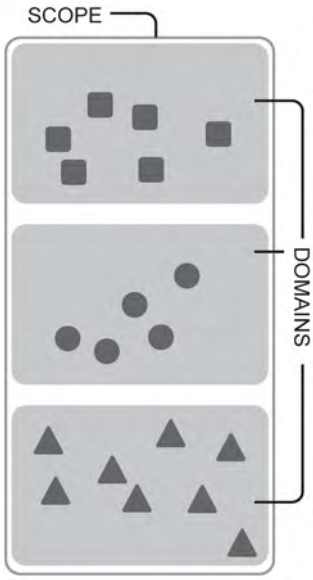

Figure 6.8: An innovation space consists of various domains with different types of information.

In fact the outcome of a foresight project must go beyond an overview of innovation opportunities. To fully appreciate the context and value of the opportunities, it is necessary to include information about the factors, trends and other insights which form their backdrop. It follows that the outcome should be considered a knowledge base which contains all the information relevant to the understanding and evaluation of innovation opportunities which have been developed during a project. The challenge of a vision project is, from this perspective, *"the mapping, exploration, and transformation of structured conceptual space"*. (Hargadon & Sutton 2000)

In this way the outcome becomes a tool that empowers people to make ad-hoc decisions and actions, and thereby makes a truly agile and adaptable organisation.

Before we are able to talk purposefully about the content of the vision project, it is necessary to construct a vocabulary. The view that the vision project is an exploration of a "space" is not new, but it has not been described in detail – presumably, because the end result has been a single solution, rather than an overview of different solutions.

The vocabulary naturally borrows terms and metaphors related to the definition of spaces and could be used indistinguishably, but for the sake of clarity they will be squarely defined as follows:

_ **Space**
The gross volume of the vision project, including all domains.

_ **Domain**
A coherent volume in which definitions and rules are shared.

_ **Sub-domain**
A volume that shares elements with other sub-domains, but also contains its own proprietary definitions and/or rules.

In the following, the main dimensions of the innovation space will be described. The purpose is not to provide answers to how the innovation space should be shaped, but to describe some aspects which have to be

considered and negotiated in the management of the content of a vision project.

Shades of radical innovation

An evaluation of the level of fundamental change is not only a matter of how much a given object is changed, but also a matter of the object itself. For example, changing the colour of a consumer product does not come close to the level of change entailed in changes to the product-service-system around such a product.

The object of innovation
Innovation can take many forms. The Doblin consultancy lists the following ten types of innovation which are grouped into four categories:

	Innovation type	Description
Finance	Business model	How an enterprise makes money.
	Networking	Value chain and partnering.
Process	Enabling process	Routine non-differentiating processes often out-sourced to others.
	Core process	Differentiating proprietary processes
Offering	Product performance	Basic features and functions.
	Product system	Structured offering with an array of tailorable, integrated components.
	Service	Assistance provided to prospects and customers.
Delivery	Channel	Conduits through which offerings reach customers.
	Brand	How value is communicated to customers.
	Customer experience	All aspects of customer interaction with a company and its brands.

Table 6.1: The Ten Types of Innovation by Doblin Research. (Doblin Research 2009)

In this study, radical innovation is first and foremost evaluated in relation to everyday activities, but in order to understand the significance of such innovation it is necessary to take into account the changes that are assumed to take place in the broader context of those activities.

Intervention
When managing the content of a vision project, an organisation's capabilities to shape the environment should also be taken into account. As the distance from the core business increases, so does the level of uncertainty, because the organisation has less knowledge and power to control the situation. The power that an organisation believes it has over its external environment can be divided into three categories (van der Heijden 2004a):

a) The internal organisational environment in which there is assumed maximum capability to shape change.

b) The transactional environment in which the organisation is one of several players and may influence, but not determine, the outcome of the game. The transactional environment delimits the scope within which the organisation has influence and marks the futures that can be

obtained by a concerted effort. Typically this is within the current business domain where relations and positions are already established.

c) The contextual environment which is beyond reach of the organisation. The organisation may indeed be affected by and have a stake in the developments in the contextual environment, but not have the capacity to influence them.

It follows that a multi-national organisation or network of smaller organisations may be able to manage the introduction of innovations which assume context-wide changes. Even though the innovation map, in principle, does not take into account the current state of an organisation, it is indeed relevant to determine its level of innovation ambition and capacity to change the wider context.

Scope

Assuming that all aspects of the world are somehow interrelated, there is no end to the number of aspects that could potentially have an effect on a subject being studied. The management of the content of the vision project is therefore very much about administration of the limited resources available, to focus on the most relevant aspects. Herein, it is important to limit the scope of the assignment, the extent of related issues to be drawn into the project, and how deeply each issue is to be analysed and envisioned. All aspects need to be negotiated and balanced as the project progresses with proper consideration of the efforts expected and the benefits for the overall objective.

It is therefore useful to distinguish between:

_ **Object of design**
The object of design is the type of answer that is asked for. The object of design is normally a part of the initial definition of the assignment. In the field of design and innovation it is commonly assumed that the solution is a new product. The object of design also indicates the scope of influence that stakeholders pose.

_ **Unit of analysis**
The object of design does not give meaning in itself. It is part of a larger conglomerate to which it must be appropriately designed. In this study, everyday activities is considered the most relevant unit of analysis in relation to the kind of questions being posed.

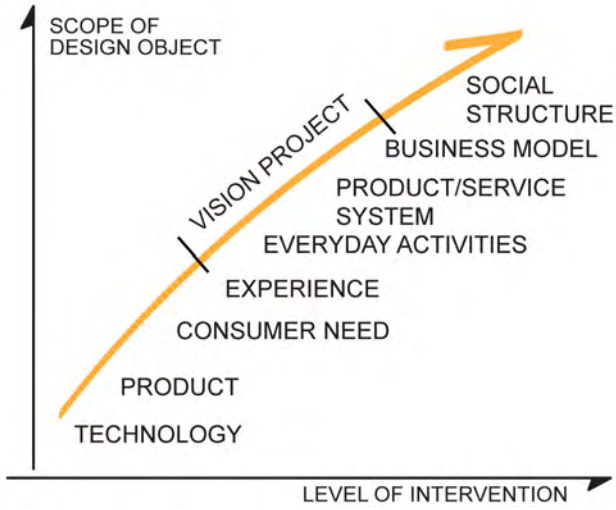

Figure 6.9: A design object assumes a certain level of intervention by the stakeholders.

Figure 6.10: Different types of results as the level of change and uncertainty raises.

_ **Context**
The unit of analysis includes more than just the object of design. All the aspects that immediately influence the unit of analysis may be denominated in the context.

Time
The level of radical innovation may also be conceptualised in terms of how far into the future the project is projecting. The further ahead, the more radical the change that may be envisioned. The amount of uncertainty increases as the time horizon is extended. At the shortest interval it is reasonable to extrapolate or predict the near future. At a medium scope it is feasible to propose scenarios, but there are too many possible outcomes to be thoroughly mapped. The far future is naturally very uncertain, but it is possible to create visions which act as guideposts.

The minimum time horizon an organisation should have is the time it takes to renew its core business. For a company producing travel bags this may be less than a year, while the automotive industry may need up to 5 years planning horizon. However this is only the scope needed to defend the current position and will eventually cause the company to stagnate. In order to grow it is necessary to look beyond the current core business and eventually take part in shaping new markets. How long is takes to introduce such innovations not only depends upon the development of technology, but also the transformation of the organisation, markets, people and society into particular configurations which are difficult to estimate.

Analytical and creative

Vision projects typically take either an analytic or a creative approach. Particularly in the field of foresight it is a key criteria that the analysis is robust and able to predict future events (List 2005, p.78). But in order to stimulate innovation it is just as important that it is inspirational and visionary. The innovation map bridges the divide between the two and builds on the best of both approaches. An overview of radical innovation opportunities should be based on a well-founded analysis of the change and continuity of the everyday, which can provide a deep understanding of the factors, forces, dilemmas, issues, values and interests that affect them. However, to explore the full spectrum of opportunities, it is required to extend the analysis with a creative approach which explores the limits of the possible and produces compelling visions that capture the imaginations of customers and partners in innovation.

It is all about understanding the change and continuity of everyday activities, what is possible to imagine, and how much it will take to aim for a particular change. By analysing and understanding the past and present we can identify different reasons for why the everyday is configured as it is today. The volatility over time also gives an indication of how strong those forces are. The analysis then gradually shifts towards how new elements are absorbed and integrated into the existing configuration. Insight into the sources of change in the past and present, may give pointers as to what might happen and provide a platform for increasingly creative and out-of-the-box thinking.

Well-founded and provisional
It is a flexible working tool that allows hard facts about yesterday to be presented together with vague speculative ideas about tomorrow. The innovation map does not pretend to provide an exact and detailed picture of the future, but a practical, easily accessible overview to stimulate meaningful discussions, support a common vision and give a point of reference for

decision making on many levels in the organization and across innovation networks. Given the complexity and rapid rate of change of the innovation context, it is neither feasible nor desirable to create a detailed and exact picture of innovation opportunities. In an ongoing daily context it is more helpful to have a general, low-resolution overview and some well-situated guideposts to quickly orient yourself.

Opportunities and values

Vision projects may either be motivated by the intention to take advantage of innovation opportunities or to impose a specific value-laden change. The opportunist approach is mainly driven by a desire to advance narrow business objectives, while the value-oriented approach is driven by a holistic view and the ambition to provide value to wider society or promote a cause beyond the organisation itself.

Typically, an organisation is situated somewhere in between,because they would like to contribute to the common good but also have to make sure that the organisation stays afloat. Their challenge is basically to leverage how much “good” they can afford and yet meet more narrow business objectives. It follows that an innovation map should contain both aspects.

6.5 NAVIGATIONAL QUALITIES

The objective of this study is to develop a methodological framework for vision projects so that the outcome can be used as a navigational innovation map. In the following, the term “navigational” will be further elaborated, so that we have more concrete guidelines for evaluating the outcome of vision projects. The three key qualities are: comprehensive, transparent and fluid.

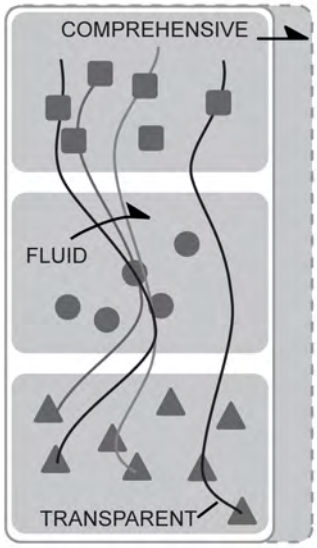

Figure 6.11: The three navigational characteristic and the foresight space.

Comprehensive
The outcome of a vision project must be framed to cover a suitable and natural area of investigation. If it is too narrow, you will move ahead with tunnel vision and most probably be taken by surprise by things coming from the sides. If the scope is too all-encompassing, it is not possible to go into depth and reveal the nature of the theme at hand. In all cases, relevant areas, which are not included in the analysis, should be clearly marked as “terra incognita”.

The central question is how to measure the degree a given innovation space has been explored. Roesler (2004) describes four dimensions of envisioning: plurality, underspecification, groundedness and calibration. Within a given scope it is important that a representative section of all the possible and desirable future developments are represented – not just one vision and the option to follow it or not. We want an overview of a wide spectrum of visions, so that the alternatives can be compared.

Transparency
Any radical concept can be instantly intriguing, but to truly appreciate the concept and understand its value, it is important to make explicit the context, trends, assumptions and other layers of information that the concept is based upon.

When making an overview of innovation opportunities it is not just a matter of coming up with sufficient ideas. Ideas are plentiful for designers and innovators. The trouble is to decide in which context, and under which circumstances, one idea is better than another. A high level of transparency into the background of a concept will also empower receivers of the information to develop their own conclusions and enter new information in relation to the specific challenges that arise.

Fluid

A dynamic world can only be represented by a dynamic map, which easily incorporates new information and restructures itself accordingly.

The outcome should provide a deeper understanding of the dynamics, so that it can be adapted to new insights in a fluid manner and continuously provide an updated overview, whereby actions and decisions can be made on the best possible background. Phaal (2001, p.14) concludes that one of two key challenges is to keep the outcome alive and assure that *"the information that it contains is current and kept up-to-date as events unfold."*

The validity of a vision project is often considered to be limited in time. When it reaches the expiry date a new project is started from scratch. The innovation map should be a constantly evolving entity which facilitates an ongoing build-up of knowledge and learning.

7 FRAMEWORK STRUCTURE

There is at the time of writing no single, uniform and logically summarized theory of how to construct a methodological framework in any of the fields of applied research which relates to the theme of this study - i.e. design, future, innovation and business studies. Actually, it is very rare that design methods are developed on the basis of any explicit reflection on the structure of methodology. In consequence there is a multitude of methods that are ill-defined and frequently overlap (Hubka & Eder 1996; Eris et al. 1999). Because it is the aim of this study to develop a framework; this chapter will attempt to create an understanding of a framework that can support the modelling of a framework and prepare us for the challenges that await.

7.1 A TOOLBOX

The purpose of design methodology in the context of vision projects is to support an innovation team's efforts to produce the best possible innovation map.

> *"Design methodology aims at providing conceptual tools for designers to organize the design process effectively and efficiently." (Roozenburg & Eekels 1995, p.30)*

In recent years methodological frameworks have often been understood as a 'toolbox' which helps structure the activities in a project and contains a number of tools that the designer or innovator can freely use on a needs basis (Kumar 2009). According to Roozenburg & Eekels (1995, p.31) design methodology consists of the following types of conceptual tools:

a) **Models** of the structure of design and development **processes**, representing the structure of thinking and acting in designing

b) **Methods** and **techniques** to be used within the processes

c) A system of **concepts** and corresponding terminology

In a classical text on scientific method, Ackoff (1962) makes a distinction among three levels of methodology:

1. **Tools** refer to physical or conceptual means, like pen, paper and instruments.
2. **Techniques** refers to action alternatives in which tools are used in specific ways, such as to construct a model or take a sample.
3. **Methods** are principles for choosing among techniques. These are decision rules or guiding principles for knowledge creation.

Bunge (1983) uses the term 'technological rule' and claims that the main objective of design methodology is to establish rules for successful human behaviour. *A rule prescribes a course of action: it indicates how one should proceed in order to achieve a predetermined goal.* (Bunge 1983, p.68). The term 'technological rule' has mainly been used by theoreticians coming from engineering sciences, while the term 'method' is a more popular and contemporary expression. Roozenburg & Eekels (1995, p.40) define 'method' as *"the consciously applied diachronous structure of an action process."* They explain (1995, p.42) that *"a method itself can be seen as a composite of a number of rules."* Processes are also a subclass of methods, which are

characterised by a linear flow. However, since 'process' is commonly used to identify the overall structure and the main phases of a project, it makes sense to use the term 'project process' in order to distinguish it from more specific methods used during the project.

The project process determines to a large extent the available resources and required deliverables of the project and is usually negotiated and committed to by management and team, while the specific techniques and tools are decided upon by individual team members with specialist knowledge.

However, design methods exist with different scope and resolution. The overall process only guides the project at the most fundamental level. Within the basic structure set by the overall process there are several levels of elements which can be applied to specific points of the overall process.

Achoff's definition reveals a hierarchy where methods are more general than techniques and tools. Similarly, Andreasen & Hein (1987) divide design methodology into three levels:

Product development includes all the activities which are related to the individual innovation project.

Product synthesis concerns the domain of product design, i.e. functions, structure and form.

Problem solving is an elementary activity which marks a step in the designer's journey from problem to solution.

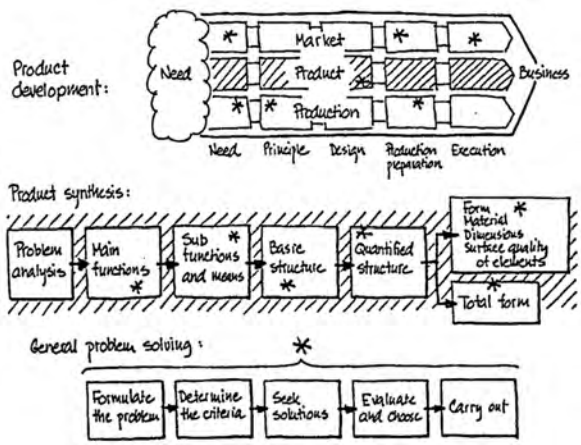

Figure 7.1: Three levels of methods (Andreasen & Hein 1987).

The view of a framework as composed of processes, models, methods, concepts, techniques and tools is a broadly accepted view and the vast majority of applied research discusses the composition and structure of these types of elements. However, design methodology does not always pay equal attention to all aspects of a framework and researchers seldom deal with all elements at once. Instead, they either work with the overall pro-

Textbox 7.1: Definitions

Design methodology: the description, explanation and valuation of design methods (Roozenburg & Eekels 1995, p.29).

Framework: a collection of concepts, processes, methods, techniques and tools which is used by an innovation team to structure their thinking and action. 'Methodology' and 'methodics' are also commonly used terms for a framework.

Theoretical foundation: a collection of theories, paradigms and assumptions on which a framework is constructed.

cess and black-box the more specific methods and techniques, or vice versa. In this project we will assume that the overall process is a type of scenario methodology and experiment with new tools, techniques and concepts in the pursuit of a more navigational innovation map. The basic scenario process will be elaborated in the next chapter.

7.2 LEVELS OF THEORETICAL ABSTRACTION

Methodologies for design, business and innovation typically are not based on any deeper reflection on the structure of the framework-to-be and many researchers assume that methods are only chosen on the basis of a problem (Arbnor & Bjerke 1997). Often new frameworks are developed on the basis of simple trial and error, or by studying leading consultancies. However, not all researchers are satisfied with the state of affairs.

> *"We point this out because too much research and consulting and too many investigations take place without any direct or conscious methodical procedures. They become technique-oriented studies – that is, they penetrate the study area only superficially and may even neglect ultimate presumptions (i.e., the methodological approach is not specified or may not even be conscious)." (Arbnor & Bjerke 1997, p.17).*

The main problem with the atheoretical attitude is that it produces endless derivatives and combinations of idiosyncratic methodologies which cannot be evaluated since they do not contain any specific information about when, or in which situations, to make use of them. It is therefore argued that the approach does not provide a foundation for further improvement and is undermining efforts to build up knowledge (Love 2002).

The claim that a theoretical foundation is all important for making efficient frameworks is supported by some of the most highly esteemed design researchers (Bunge 1983; Roozenburg & Eekels 1995; Hubka & Eder 1996). Arbnor and Bjerke (1997, p.9) specify that for frameworks to be consistent and effective, *"they must 'fit' both the problem under consideration and the ultimate presumptions held by the creator of knowledge".* Eder (1999) also claims there is a close relationship between basic theory, methods and the study object under consideration:

> *"The theory declares what is in reality the case, the method describes, on the basis of the declared facts, how the scientific and practical activities and behaviors of the humans should take place to achieve best effectiveness." (Eder 1999, p.33)*

Arguments against theoretical abstraction

Nevertheless, the theoretical foundation is rarely stated explicitly by design researchers who propose new methodologies and it seems that the wider design community is unaware of the theoretical aspects in their work (Cross 1995; Love 2000). One reason may be that design methodology is an applied field of research so there is an innate scepticism that theory can solve real-life problems, because practitioners often know by experience how to solve practical problems. In many cases the link between framework elements and theory can be highly arbitrary, and a tool or technique may contain references to various theories, so it is no wonder that among practitioners, theory is believed to be a needless complication.

In consequence it is common for researchers to collect tools and techniques from diverse fields of study and present them as part of the same toolbox (Kumar 2009). These toolboxes have shown to be effective in practice and are popular among designers. The ability to produce quality innovation maps without a clear theoretical foundation further substantiates the

belief that a practical and efficient framework is best developed without theoretical reflections.

Another reason for the lack of theoretical reflection may be that new methodologies are typically imported from other areas of applied research and only need smaller adaptations before they can be put to use in the field of design. The benefit is that designers can quickly evaluate new methodologies and avoid lengthy theoretical discussions. This has proven to be a very efficient model for producing a wide variety of design methodologies.

Finally, it may be that modern challenges are so complex that they cannot be fully understood at the outset of a project, and the most effective methodological approach is to improvise and quickly apply a number of different tools and perspectives, without a preliminary theoretical foundation. In all cases the framework should not become too theoretically deep or sophisticated, because it may require too many resources and the same effect may be obtained more efficiently by simpler means. In the context of vision projects we need to keep in mind that efficiency is the main concern,not truth, as in pure scientific research.

Exploring the potential

While most arguments for or against a theoretical approach are based on belief and covert assumptions, in this study we will take both sides of the argument into consideration and explore to which extent different levels of abstraction can improve the quality of the innovation map. Herein it is not a simple matter of showing that a type of approach can be effective. A new approach must also be translated into a concrete framework that is suitable for the context of vision projects.

As a starting point for exploring the potential of different levels of abstraction and new types of methodological approaches, we will in the following section present a level of abstraction that has been presented by the founders of design methodology.

7.3 SUBSTANTIVE AND OPERATIVE KNOWLEDGE

The overall purpose of a vision project is to learn about change and guide transformation from one real world situation to another. In this regard scenario making is similar to designing. Simon (1996, p.111) says *"Everyone designs who devises courses of action aimed at changing existing situ-*

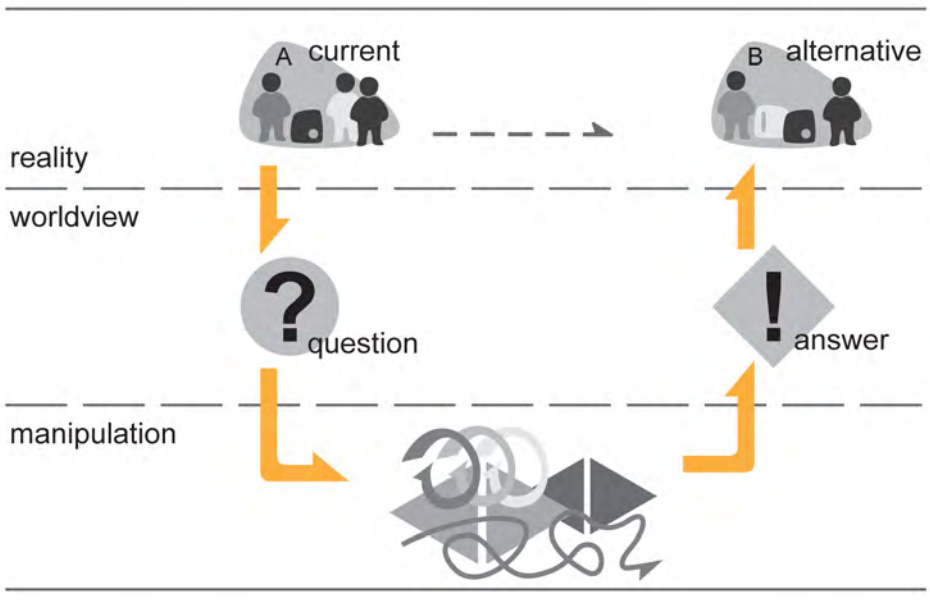

Figure 7.2: Conceptual aspects of a framework.

ations into preferred ones". It follows that scenario and design knowledge is more extensive than theories of science, because they are not limited to account for what did or might happen, but are concerned with **what ought to be done** in order to shape the world (Bunge 1983).

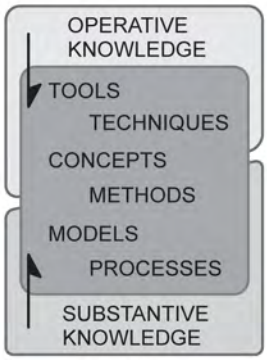

Figure 7.3: A framework is constructed on substantive and operative knowledge.

At the most abstract level a vision project involves two conceptual aspects. The innovation team - or designer - starts by observing the real life situation and may hereby perceive some problems, challenges, issues or potentials which can motivate an exploration of alternative situations (see chapter 4, "Modern Challenges") The perception of the real world is founded in the designer's world-view – or the world-view embedded in the methodological framework used to analyse the real world. The result is a 'designed' question that the vision project seeks to answer. The world-view also determines how an intervention may change the real world and thereby the types of possible answers. In the context of this study the answer is an innovation map, which contains an overview of perspectives, possible and desirable scenarios, and corresponding innovation opportunities (see chapter 6, "The Innovation Map"). The manipulation of a question into an answer is a process of problem solving, learning and discovery. It involves the exploration, selection, mapping and integration of alternatives.

In summary vision project processes contain two main conceptual aspects: the world-view, i.e. the interpretation of reality into a question and the conversion of an answer into reality, and the exploration of alternatives which manipulate questions into answers. The model corresponds to theories of deliberative action in which interaction with reality is based on a translation into *"an abstract symbolic domain governed by formal rules and symbol manipulation."* (Johnston 2001, p.234).

It follows that a theory may have an effect on methodology either by providing knowledge of the objects in action or because it concerns the action itself. In other words a theory may have relevance either because it speaks about the nature of reality or how to transform a question into an answer. According to Bunge (1983) the first kind of theory is 'substantive' while the latter is 'operative'.

The distinction reflects the double meaning of the term 'design' (Eder 1999). As a noun it refers to the object of design. In traditional design the object is a technical artefact or system – its properties, structure and relation to the context (Hubka & Eder 1996). Alternatively, the term 'design' is used as a verb to designate the processes of designing, that is the process of exploring, mapping and selecting solutions. Van Aken (2005) calls this 'object knowledge' and 'process knowledge'. Together the substantive and operative theories constitute the two main types of knowledge in design and scenario methodology and may contribute to a new methodological framework. That potential is explored in the following sections.

Substantive knowledge

How to understand reality has been the object of discussions for centuries – if not millennia. The natural sciences seek to explain physical and biological aspects while the humanities investigate the social world. Design questions are usually composed of both material and human issues and must therefore encompass paradigms from several fields of research. The world-view is decisive in how problems are framed and the types of answers that can be given. Therefore, even though modern challenges are based on 'real' events, they are also an indication that people's world-views are changing.

Furthermore, many modern challenges may not so much be a result of a radically new world-view, but the application of several world-views to a

concrete situation. To deal with this kind of compound questions, the framework also needs to contain different perspectives on reality. In consequence the assembly of a variety of perspectives into a coherent and consistent unit is fundamental to the construction of a new framework.

According to Roozenburg & Eekels (1995, p.31) *"Substantive knowledge is knowledge about the composition and functioning of the natural and artificial objects and systems surrounding us."* In other words, it is not only about what exists in the real world, but also how the elements interact. The relations and interactions between elements determine to a large degree what will or may change through intervention. A world-view may thus also include specific concepts and rules for how to explore alternatives.

The content of design
Design schools teach very specific ways of understanding the environment and attributes of a product (Andreasen & Hein 1987; Roozenburg & Eekels 1995; Hubka & Eder 1996), so that designers do not have to invent the wheel for every industrial product that they design. However, in this study the unit of analysis is not a product, but the 'everyday' of which these offerings are a part. In consequence design's traditional product-centric world-view is not suitable for the present kind of investigation, nor is the macro-factor oriented ontology of foresight studies.

A central challenge of this research project is therefore to explore different ways of defining an ontology suitable for vision projects that result in relevant and navigational innovation maps. Substantive theories are always preceded by scientific science (Bunge 1983) and new methodological frameworks may be inspired by a wide range of theoretical fields, such as engineering, biology, systems theory, evolutionary theory, sociology, etc.

In summary the substantive knowledge may give insight into:

- Which kinds of problems, issues, challenges or potentials are important to address
- How to conceptualize the questions about the real world
- The types of answers that may be proposed
- How questions and answers are connected
- How real world phenomena may change or persist.

Emerging understanding
The interpretation of reality is not something that necessarily precedes all other aspects of the vision project. Especially in complex projects with social aspects involved, it is seen that the understanding of reality, the questions and the relevant answers are interlinked and will co-evolve in the course of a project.

Cross (2000) states that:

- **Formulations of the problem are solution-dependent:** Ways of formulating the problem are dependent upon ways of solving it; it is difficult to formulate a problem statement without implicitly or explicitly referring to a solution concept. The way the solution is conceived influences the way the problem is conceived.
- **Proposing solutions is a means of understanding the problem:** Many assumptions about the problem, and specific areas of uncertainty can be exposed only by proposing solution concepts. Many constraints and criteria emerge as a result of evaluating solution proposals.

The interpretative – or hermeneutic – aspect of a vision project is therefore fundamental in the process of developing an innovation map.

Operative knowledge

Design, innovation and vision projects are characterised by the objective to explore alternative situations. The substantive knowledge explains how to perceive situations, but not how to envision new situations. The process of generating knowledge about alternatives is, in principle, independent of the world-view – or 'empirical void' – and rooted in a different breed of knowledge called operative knowledge.

Operative knowledge directly concerns the valuation, decision making, planning and doing. Its foundation comes from mathematics, statistics, didactics, systems theory, operations research, logistics, information theory, instructional design, computer science, decision theory, law, etc. They do not refer directly to reality, but make use of more idealized theoretical models, such as 'probability'. Bunge (1983) calls them 'theories of action'.

Heuristics

Within operative knowledge there are different categories of knowledge. Algorithmic disciplines prescribe precise rules of reaching an exact solution. These types of knowledge contain their own system of formal logic and new theories can be tested for internal logical consistency. The verification is therefore 'evidence-based'.

However, the exploration and mapping of alternatives in the field of design and innovation cannot be described through formal logic, so a different class of methods are used in this context. These methods are called 'heuristics'. They seek to rapidly come up with the best possible answer, without claiming to produce a scientifically true answer. Heuristics are useful to efficiently find solutions that is close to the optimal solution. Heuristics can be described as 'design exemplar' which is a general prescription which has to be translated into the particular context of a problem. For example, a heuristic rule may be describe as *"if you want to achieve Y in situation Z, then something like action X will help"* (van Aken 2004, p.227)Therefore a heur-

Textbox 7.2: Heuristic methods

General problem solving
The famous mathematician, Polya, devised the following heuristic method for solving problems: The method consists of main steps (Polya 1957):

1. **Understanding the problem**
   What is unknown? What are the conditions? Are they sufficient? Or contradictory? Separate the various parts of the condition.
2. **Devising a plan**
   Have you seen it before in a slightly different form? Can you restate the problem? Solve a related problem.
3. **Carrying out the plan**
   Check every step. Can you prove that they are correct?
4. **Looking back**
   Can you check the result? Can you derive the result differently? Can it be used for a different problem?

Design process
Design methods are mainly heuristic methods. Cross (2000) notes that designers rely on a variety of strategies and these strategies continue to evolve. However, Cross identifies a general process comprised of seven design stages:

1. Clarifying objectives
2. Establishing functions
3. Setting requirements
4. Determining characteristics
5. Generating alternatives
6. Evaluating alternatives
7. Improving details.

istic method has a *“general purport, but you should not always adhere to them.”* (Roozenburg & Eekels 1995, p.42).

Heuristics are 'experience-based' which often relies on educated guesses, common sense or intuitive judgement to find an appropriate solution based on readily accessible information. The efficiency comes often at a cost in terms of accuracy and precision, but for practical success it is more critical with speed and adaptability. The overall aim is to get things done, rather than gaining a deep understanding of them. The applied researcher will therefore attempt to schematize the system as a 'black box' with no substantive content. Occasionally, the designer may be forced to engage in a deeper level of understanding, but the underlying scientific theories will only be used as tools and on a need-to-know basis.

Experienced designers tend to use informal procedures for their design process, which is either passed on in a craftsman like manner or learned through practice. However, in the context of design methodology we are not looking for actions based on conventions, habits or superstition, but mainly guided by explicit and codified scientific or technical knowledge. This type of acts are 'maximal rational' because they are either field-tested (experience-based) or grounded on insights from sciences (evidence-based), which enable a gradual improvement of action (Bunge 1983; van Aken 2004).

Generic design activities
Sim and Duffy (2003) classified generic design activities into three categories:

- **Design definition activities**: these activities seek to manage the complexity of the evolving design while increasingly defining it, until it has all the details required for production.
- **Design evaluation activities**: these activities seek to analyse and evaluate the feasibility of potential design solutions and, by discarding unfeasible solutions, reduce the design solution space.
- **Design management activities**: these activities seek to manage the complexity of co-ordinating activities related to an evolving design and its process.

The navigational characteristics of an innovation map are first and foremost related to the design management activities involved in the transformation of a design problem into a design solution(s). These key activities are: constraining, identifying, information gathering, exploring, resolving and selecting.

Heuristics are omni-present in design and prescribe for example how to gradually define a concept or how to find a solution through divergent and convergent exercises. Kolb's learning circle is another example of experience-based operative knowledge which is widely used in design methodology.

Not only designers, but a wide spectrum of professionals, such as medical doctors, architects, business people, psychotherapists and engineers, solve real-world problems through the use of heuristics. Design methodology may therefore be inspired by applied research from fields like architecture, engineering, management and business (Schön 1983).

7.4 FRAMEWORK CHALLENGES

The main challenge is to understand how different levels of abstraction - or types of methodological approaches - affect the qualities of the innovation map. We have in this chapter outlined a level of abstraction that distinguishes between operative and substantive knowledge, but we cannot know beforehand if this is a relevant level of abstraction. Maybe the toolbox mindset suffices or perhaps there are more advanced levels of abstraction which have a bigger potential for improving the innovation map.

To understand the potential at each level of abstraction it is necessary to model concrete approaches within a given level of abstraction; the investigation of possible approaches, and their applicability in the context of vision projects, is also therefore an important challenge of the research. For example, within the toolbox mindset it is natural to freely import any type of framework element from related fields of study, while we at the substantive/operative level look for inspiration from more specific fields of theory (See Figure 7.4). Hubka and Eder (1996) provide a more comprehensive overview of potential theoretical sources of inspiration for design research.

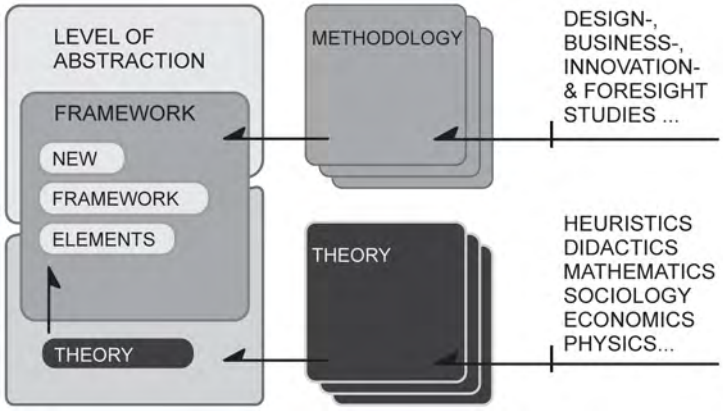

Figure 7.4: Sources of inspiration for a methodological framework.

When developing a concrete new approach and integrating it into an applicable framework we face a number of challenges. Firstly, the final framework that is intended for practitioners should be applicable in the context of vision projects. It must be suitable for the skills and resources that are available for the project and all framework elements should constitute a coherent and consistent unity. The challenges related to creating this framework are highly related to the findings concerning the level of theoretical abstraction that is most relevant. At any given level of abstraction there will be challenges concerning creating a coherent and consistent theoretical foundation from which a powerful new framework can be built.

In the following we will elaborate on the issues that are related to the framework, leaving the issue about integration of theory for later, since we do not yet know the type of theoretical abstraction that is most relevant.

Properties of a framework

In the construction of a framework there are several aspects that must be considered in order to create an effective, coherent and consistent framework. Innovation teams are creative and capable of adapting a framework to the specific context, but if the elements of the framework are incompatible it unavoidably leads to frustration and a less-than-optimal outcome. In the following we will reflect on the issues that can arise within a framework,

in relation between framework and theory, and finally, within the theoretical foundation.

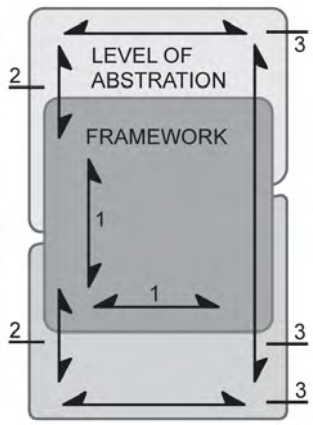

Figure 7.5: Framework issues. 1) within framework; 2) between framework and theory; 3) within theory.

Practical
The framework is first and foremost used by multi-disciplinary innovation teams and should be appropriate for their way of working, their skills and the available resources. A clear methodological structure is for example important to coordinate the activities between different team members, and visualization is important to share ideas and stimulate creative thinking. In the context of innovation, deep or sophisticated theories often prove inefficient, because they require more resources which are not compensated sufficiently by a better outcome. The overriding concern of the designer is high efficiency, so low quality may be compensated by low consumption of resources.

Constructive
The collection of elements that make up the framework should also support one another. Abnor and Bjerke (1997) stress the importance that methods are constructive and fit each other. Methods are created from possible techniques against the background of problems or challenges that are being faced. It is possible to change the sequence of techniques or modify individual elements as long as the totality of the framework is coherent and consistent.

Level of specification
It is a central dilemma in the construction of a framework to strike a balance between the generic and specific. Van Aken (2004) defines a technological rule as *"a chunk of general knowledge, linking an intervention or artefact with a desired outcome or performance in a certain field of application."* To be general a rule must be applicable to a class of problems and not only for a specific situation and context. This implies that there is a limit to the specificity of the object matter and practitioners must adapt and elaborate the framework ad-hoc. Van Aken suggests a 'principle of minimal specification', so that a framework only contains information on a need-to-know basis.

An overview

The main objective of this study is to improve innovation maps' navigational qualities by modelling a framework. However, a framework does not directly impact the outcome of a vision project. The methodological framework is, in essence, a support for the innovation team's project process. It is through the support of the project process that a framework affects the outcome. The development of a framework is therefore primarily guided by a specific understanding of how to support the management of the content. For example, a framework may support management by providing guidelines for framing and focusing the assignment, unfolding the context, interpreting information or integrating content from different domains. In this study we are particularly interested in understanding how the framework can make the innovation map more navigational. As a final step it is important that we determine how the different aspects of management affect the qualities of the innovation map.

Now let us look at the challenges that are related to the construction of a framework. A framework needs to be coherent and consistent, because all the elements have to be negotiated into a whole. In this study a basic process has been constructed in a pre-study, so the elements of a new approach have to be integrated with the basic process. The construction of the approach is also a complicated affair. Firstly, we must consider different

levels of abstraction, and secondly, we must find a theory or methodology which can be transformed into elements of an applicable new approach. We do not know beforehand which levels of abstraction exist, nor has it been decided beforehand where to look for new knowledge.

All in all, the aim to make the innovation map more navigational by modelling a framework involves a multitude of aspect as depicted in Figure 7.6.

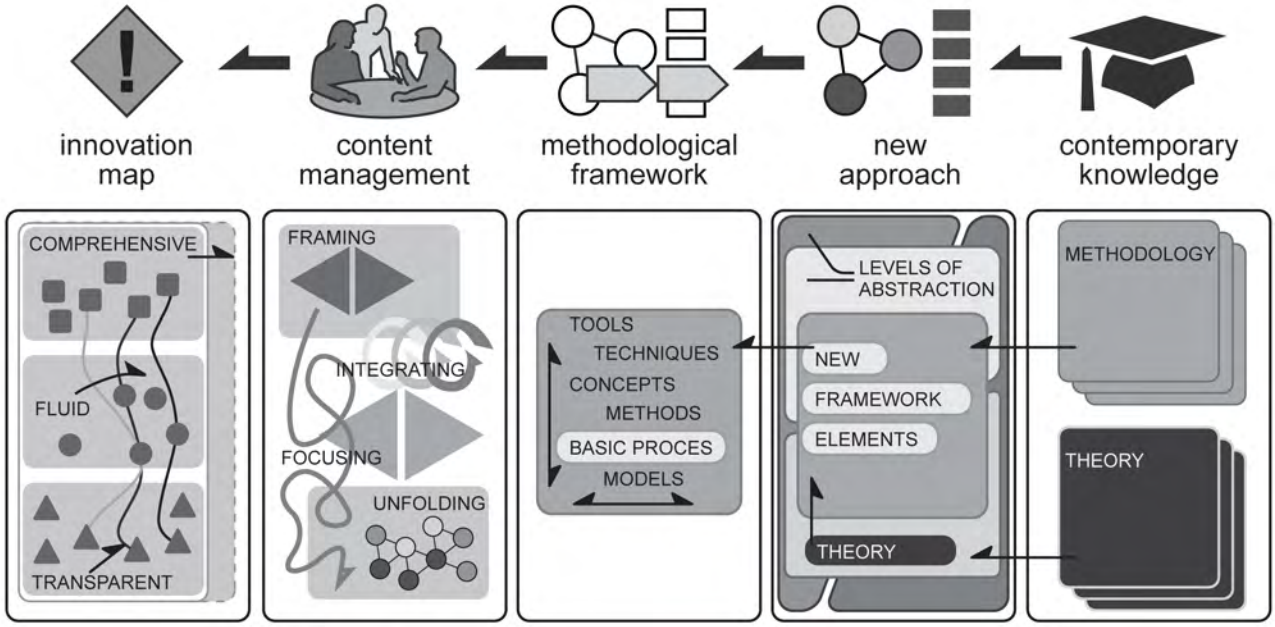

Figure 7.6: Overview of issues related to the development of a methodological framework.

8 CONTEMPORARY METHODOLOGY

This chapter investigates existing methodologies that are potentially relevant for vision projects. The purpose of the chapter is two-fold. Firstly we will construct a basic scenario process tailor-suited for the development of an innovation map. The process will later serve as a basic foundation for experimentation, so that new and more specific methodological approaches can be developed without having to 'reinvent the wheel'. Furthermore, it will make it possible to test, evaluate and compare new approaches within a relatively stable setting. Secondly, we will review some key methodological aspects which may inspire the development of new approaches. These aspects are divided into three groups:

1. Defining content
2. Analytical interpretation
3. Value-based visioning

The methodologies used by Siemens and Philips have already been presented in chapter 3, “State-of-the-art Portfolios,“ and compliment the methods described in the following review.

8.1 SCENARIO METHODOLOGY

Exploring the innovation space involves moving around many dimensions from past to future, possible to desirable, everyday activities to innovation opportunities, concepts to solutions, etc. In particular two methodologies are relevant for this endeavour. Scenario methodology explores alternative situations and fits the overall structure of a vision project, while design methodology holds the key to defining, exploring and developing the content within a given situation in time and space. As such the design methodology is an essential aspect of vision projects, but since it is assumed that the reader and the innovation teams in the experiments are familiar with design methodology the following will focus on scenario methodology.

The exploration of alternative futures is commonly associated with scenario thinking;the alignment with the objectives of the innovation map is obvious in the following definition:

> *“Scenario planning is a process of positing several informed, plausible and imagined alternative future environments in which decisions about the future may be played out, for the purpose of changing current thinking, improving decision making, enhancing human and organization learning and improving performance”. (Chermack & van der Merwe 2003)*

Scenario thinking is especially developed to deal with complexity and uncertainty. Scenarios are therefore by nature tentative and provisional human constructs rather than historical records. In the methodological realm they occupy a middle ground in the exploration of the future and typically deal with a time horizon of three to ten years. Scenario thinking is situated in between the analytical, short-term forecasting techniques and the bold statements of visionary gurus. Forecasting can be done with a high level of detail and probability, while the more uncertain and abstract types of visions are highly dependent on the underlying assumptions and the ability to capture the wider context.

Since scenarios became popular in the 1960s, they have found application in an increasing number of sectors and disciplines. Scenarios are now being used by decision-makers, consultants and researchers in a variety of situations which have given rise to a wide range of derivatives of the overall scenario methodology.

Scenario types

Policy-orienting scenarios

The most popular scenario methodology comes from strategic business planning and is focused on reducing complexity in order to reach a consensus and make a management decision. Cornish (2004) suggests a set of five common scenario plots: continuation, optimistic, pessimistic, disaster and transformation. Other approaches propose only two or four scenarios, which are constructed on the basis of a selection of one or two parameters that are considered to be decisive for the future. Such scenario constructs are particularly common in policy-making and mainly serve to instigate action in times when uncertainty is likely to paralyse decision-makers. For example the two scenarios for an organisation may describe a situation of 'business as usual' versus an 'ideal state' (Ackoff 1978).

A typical scenario process is structured in the following way (Schwartz 1991):

1. Identify focal question or decision
2. Key forces in the local environment
3. Driving forces
4. Rank by importance and uncertainty
5. Selecting scenario logics
6. Fleshing out the scenarios
7. Implementation
8. Selection of leading indications and signposts

Design-orienting scenarios

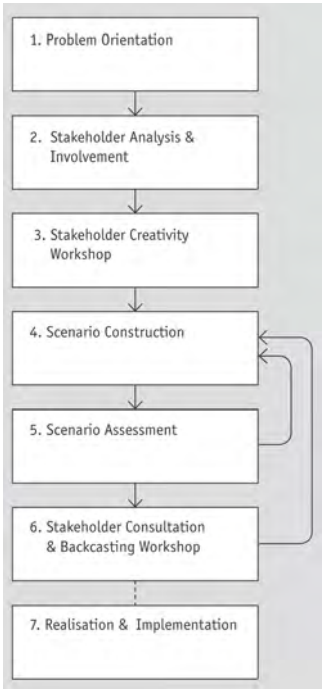

Figure 8.1: Sushouse process. (Quist 2007)

The innovation map focus on innovation opportunities in the context of everyday activities and therefore need to combine scenario methodology with design methodology, which seeks to develop solutions within a particular context and offers a deep understanding of people, products and culture through methods derived from ethnography (Cooper & Evans 2006).

Since the late 1990s there has been some attempts to combine the scenario and design methodologies by leading universtities and design consultancies (Evans 2003; DFFN 2003; Rodriquez 2005). The resulting methods have been called 'future led', 'solution'- or 'design'-oriented but all aim to envisioning concrete opportunities and apply the basic scenario process in a very different way than strategic planning.

Manzini & Jegou (2000) use the term “design-orienting scenarios” (DOS) to describe scenario work which *“propose a variety of comparable visions that have to be clearly motivated and enriched with some visible and (potentially) feasible proposals.”* (Manzini & Jegou 2000, p.3). The analytical unit of DOS is the physical and socio-cultural context in which actions take place, i.e. everyday activities. All in all, the DOS approach to scenario work aims to develop an innovation map as described in chapter 6, “The Innovation Map“.

After an initial problem orientation and stakeholder analysis, a creative workshop was conducted with stakeholders. The workshop aimed at gener-

ating ideas about the future opportunities and clustering these ideas into proto-scenarios. A research team then elaborated the scenarios further, to a point where they subsequently could be assessed in terms of impact on the environment and consumer acceptance. Depending on the result of the assessment the process may either proceed towards realization or backtrack to one of the previous steps.

Network-orienting scenarios

The above scenario methodologies are designed to create a limited number of possible scenarios that make decision-making easy. A scenario is originally described as being an end-state and a sequence of events, but the above methods emphasize the end-state and do not explain the sequence of events which lead to the scenarios. Dennis List (2005) aims not only at representing a sequence of events, but also a network of scenarios across various time horizons. In order to map the scenario space a number of techniques are used to explore various sections which are then graduallyintegrated. The process consists of five stages:

1. Tracing the past through to the present
2. Probing the present
3. Looking ahead from the present
4. Creating morphological paths, and backcasting along them
5. Midcasting: anticipating discontinuities

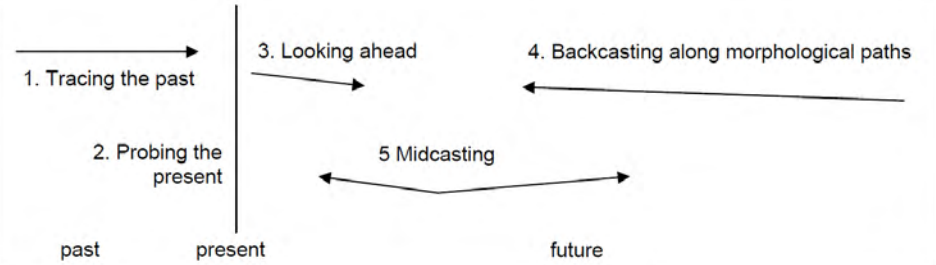

Figure 8.2: The 'scenario network' process. (List 2005)

The creation of an overview of alternatives is a core characteristic of the innovation map and the framework developed by Dennis List is one of few that attempts to do so. Another characteristic of the innovation map is the focus on innovation opportunities and everyday activities. Most scenario work focuses on macro-level factors and most of those who incorporate a micro-level perspective have little insight into the field of design and innovation. However, within the field of design and innovation there have been attempts in recent years to shape an academic field combining scenario methodology and design.

Scenario characteristics

The development of the scenario methodology has not been coordinated, but in recent years there have been several attempts to create an overview and develop a typology for the many variations. For example, the futurist Masini (1993) distinguishes between descriptive, normative, objective, subjective and systemic scenarios. Inayatullah (2002) mentions four overlapping research dimensions: empirical, interpretive, critical and participatory.

Van Notten (2003) has sought to create an overview and an updated typology of scenarios. The study identified a number of characteristics in relation to three overarching themes: project goal, process design and content (See Table 8.1).

Theme	Characteristic
Project goal: exploration vs. decision support	Inclusion of norms: descriptive vs. normative
	Vantage point: forecasting vs. backcasting
	Subject: issue-based, area-based, institution-based
	Time scale: long term vs. short term
	Spatial scale: global/supranational vs. national/local
Process design: intuitive vs. formal	Data: qualitative vs. quantitative
	Method of data collection: participatory vs. desk research
	Resources: extensive vs. limited
	Institutional conditions: open vs. constrained
Scenario content: complex vs. simple	Temporal nature: claim vs. snapshot
	Variables: heterogeneous vs. homogeneous
	Dynamics: peripheral vs. trend
	Level of deviation: alternative vs. conventional
	Level of integration: high vs. low

Table 8.1: Scenario characteristics. (van Notten et al. 2003)

The overview of scenario characteristics is not so much a matter of either/or, but aims to describe the main parameters which must be negotiated in the formulation of the project brief and further elaborated in the course of the scenario process. For example, the innovation map bridges many of the scenario characteristics. It is both descriptive and normative. It provides an objective insight into an area of study, but is also intended for developing more subjective views with reference to a specific actor. It is anchored both in analysis of a contemporary field of everyday, and in the values and situations that are desirable. However, the innovation map also has a number of characteristics that put it in its own class. The outcome should be transparent, so it cannot be based on black-boxed statements of experts. It focuses on micro-level everyday activities and people's experiences – in other words, on qualitative and not quantitative data.

Key characteristics of the innovation map

The intention in this chapter is to put together a basic framework platform for the innovation map based on scenario methodology, but none satisfy all of the framework's demands for making an innovation map. Before we are able to compose a fitting platform we must therefore look into some of the key characteristics of the innovation map .

Firstly, we will investigate how to explore a network of alternatives. Essentially, there are two approaches to exploring alternatives: descriptive and normative. In this study we will use the terms analytical interpretation and value-based visioning in order to better describe the nature of the related methods.

The 'interpretative' perspective argues that there are factors beyond the control of the stakeholders that influence the change of a particular field of

study. It follows that if we want to learn about new, radical innovation opportunities we need to disclose the factors, driving forces or regimes, which determine the possible contexts of innovations. Herein, scenarios investigate potential futures irrespective of their desirability.

However, organisations usually have some power to intervene and shape their external environments, in particular in collaboration with other stakeholders. The 'intervention' perspective assumes that there is a 'best' future to pursue and seeks to envision desirable new situations. It involves the clarification and interpretation of values. Ogilvy (1996) says that it is indeed the explicit consideration of ethical values which distinguishes future studies from other social sciences. The development of desirable futures typically involves an appreciative inquiry and a broader participatory effort. The process is value-oriented and explores how new solutions may embody preferable values.

Another characteristic of the innovation map is the focus on the micro-level, i.e. products and everyday activities. The focus is all-important for the unfolding of the content of the innovation map. It determines the nature of the scenario and which aspects should be taken into account when envisioning alternative situations. The conceptualization and unfolding of the content also has a profound effect on the interpretations and values in relation to exploring alternatives.

These aspects concern a more specific methodological level than the scenario method, but an understanding of their nature is important for putting together an overall methodology and for the later development of new and more specific approaches.

8.2 THE BASIC PROCESS

The review of methods has shown that there are many versions of methods which seek to address the same issue of exploring alternatives. For example, the analytical interpretation not only concerns how to reach lower levels but also the dimensions that are being deepened. The Causal Layered Analysis emphasizes underlying paradigms as the cause of change and continuity, while the Iceberg model investigates the dynamics of relations between elements. Another possibility is to analyse power structures and the social constructions which shape configurations of actors and the discourse on different phenomena. Few scholars and practitioners reflect upon the underlying assumptions of their particular methods and scopes of application, which only adds to the confusion.

In this study we seek to develop a methodological framework for a navigational innovation map which defines a specific purpose and situation. The challenge is to select, modify or reframe the methodologies so that they are suited for this particular context. However, before we enter the phase of development and experimentation, we will construct a basic scenario-based framework which can serve as a foundation for the development of a more detailed methodological approach. By defining some basic concepts and processes which are fundamental for the creation of an innovation map, we avoid having to reinvent the basic structure and can instead focus our attention on more specific aspects.

Main concept

Both the analytical and value-based approaches contain important aspects in relation to the overall ambition to explore alternatives. However, there is no unifying theory on how to integrate these elements into a coherent whole

combining the best of both. Dennis List (2005) has for example put together a comprehensive framework with the aim of creating a 'scenario network', but it lacks the value-based component. There are also examples of models which, to a certain degree, integrate the analytical and visionary components into a single model, such as the VIP approach or Theory U, but they do not bring out the full potential of both approaches.

There are no fundamental incompatibilities between the two approaches, but when combining the two approaches, their individual characteristics should be considered. Most importantly they address different horizons of the radical change. The analytical approach builds on an understanding of the present and is best suited for the near future, which to a large extent is confined to the present structures and emerging developments. The value-based approach assumes a very different mindset which is open to radical change on a large scale and a belief that the future may be shaped by intervention. This level of change usually extends into the far future.

It follows that each approach is suitable for exploring different domains of change in the innovation map, but that they should be executed in series to make the best of each approach. Given their particular capabilities to enlighten different aspects of the possible and desirable, their union may provide an even stronger foundation for the innovation map. Furthermore, it can be argued that the value-based visioning should follow the analytical interpretation, so that the visioning can build on the extrapolation of the present into the near future and emerging issues can be revealed in the process.

Extrapolation and Backcasting

In order to provide a comprehensive and transparent innovation map the development of the near future and visions for the far future need to be connected to form a coherent whole. This is achieved by using two common techniques in future studies: extrapolation and backcasting.

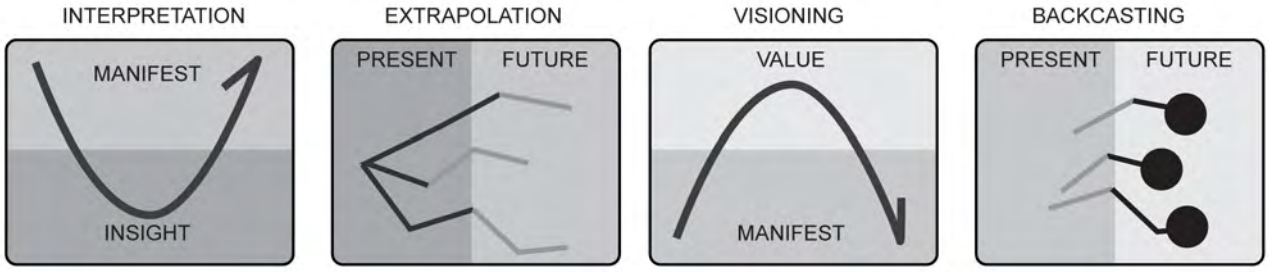

Figure 8.3: The basic moves of the scenario process.

Extrapolation extends the development of the near future as far as possible into the future, while backcasting traces far future visions back to the present. Herein, it may be observed that multiple trajectories lead to the same goal. There is naturally a limit to the distance that either technique is able to reach in either direction. The idea is that they should meet midway and integrate seamlessly, so that there is coherent insight across all horizons.

The four basic elements of the overall process are shown in Figure 8.3. Even though there is no formal convention, it seems natural to depict the process of analysis as going downwards towards 'underlying' patterns, while the search for values can be depicted as going upwards towards 'higher' levels of abstraction and meaning.

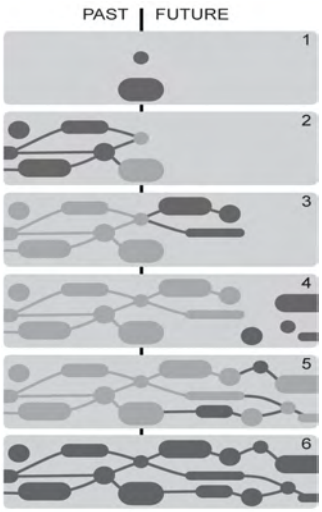

Figure 8.4: Exploring the innovation space.

The sequence of the basic elements leads to the following processes:

1. Unfolding and population of the present
2. Tracking the evolution of the relevant key aspects back in time
3. Interpretation of change and forecasting of the near-future
4. Clarification of values and visioning of desirable future situations
5. Connecting the forecasting of the near future with the desirable future situation
6. Integration across all domains

The overall process is illustrated with different levels of abstraction in Figure 8.5 and as an unfolding of the manifest level in Figure 8.4. The final step takes into account that it may be useful to revisit and integrate the domains in an iterative process, but the step does not constitute a novel element in itself.

> *"Constructing scenarios almost automatically results in an iterative process wherein people move back and forth between interrelated phases and activities." (Postma & Liebl 2005, p.163)*

The above-mentioned framework assumes that the starting point is defined as an area of investigation in the present. Not all assignments come in this format. When the assignment is defined as a future area with no immediate relation to the present, it may be useful to start with the visioning process in step four and gradually investigate how those visions are related to the present.

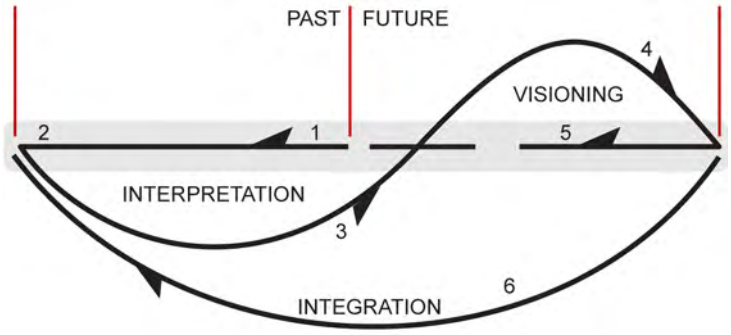

Figure 8.5: Abstraction movements in the innovation space. The grey area in the middle corresponds to the manifest level. Numbers correspond to processes described in the text.

8.3 DEFINING CONTENT

When mapping innovation opportunities it is naturally important to make a comprehensive overview showing the full spectrum of possible and desirable opportunities. In addition to the exploration of alternatives, we need to understand the value of each of the innovations. It is therefore necessary to include a description of the aspects on which any particular innovation depends.

It has already been argued that 'everyday activities' is a relevant unit of analysis to understand the potential of an innovation in relation to modern challenges, such as improving quality of life and furthering sustainable innovation. But in order to provide a well-founded picture of the alternatives we need to investigate the wider web of factors that new offerings and everyday activities are part of. That wider web of factors is often called the 'context'. The term indicates that something is beyond the focal point, but it does not however indicate where it stops. Since all factors are connected

one way or the other, there is no simple answer to the extent of the context. The scope has to be negotiated in relation to the concrete objective and theme of the particular project. Even though there are no definite boundaries, the conceptualisation of the content and context is an important part of a methodological framework and will be investigated in relation to the concept of an innovation map.

The assumption behind this review is that one definition of context is not definitively better than another. Essentially, each definition is a manifestation of a specific perspective – or worldview – with the potential to enlighten certain aspects of a given situation. It is therefore likely that more than one perspective is needed for a given assignment. The challenge is to decide when to use the different perspectives. For the time being we will continue with the terminology of context rather than the underlying perspective, because the definitions of content and context are immediately relevant to the practical project work and are evident from the methods being used. In contrast, the worldview is rarely described in the field of design and innovation.

In the following, we will present some definitions of context from the field of design that have the most immediate relevance for the creation of an innovation map.

Use context

Since the mid 1980s the user has assumed a very central role in design and over the years a number of perspectives have been presented on the relationship between products, users and the wider context.

Typically, designers emphasize either the user's needs, the experience or interaction as the defining element that links a product to the user. The context of these elements is then unfolded further in the situation, which may encompass both the physical setting and/or the socio-cultural situation (Figure 8.6 & Figure 8.7).

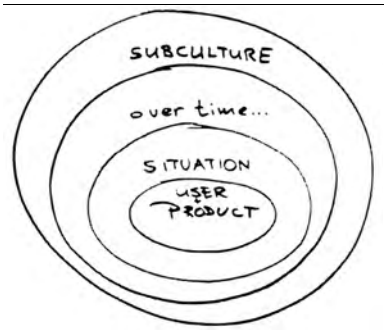

Figure 8.6: Onionskin model of context. (Stappers & Visser 2005)

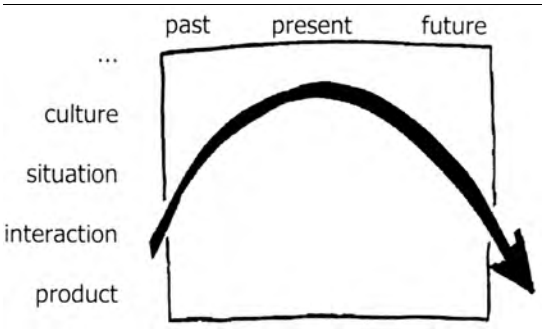

Figure 8.7: Designing a product by taking a detour through the context. (Stappers & Visser 2005)

An example is the “Highly Customerised Solutions” project (HiCS) which was undertaken by Philips Design and nine European partners. The visionary project, which aimed at generating context-specific and sustainable solutions for people with reduced access to food, developed and implemented a new design methodology (Lindsay & Rocchi 2004). The methodology unfolds the interaction context by investigating both the users' cultural context and their physical situation (See Figure 8.8). Simona Rocchi, Senior Research Consultant at Philips Design, says:

> *“The cornerstone of the methodology is that researchers, designers and users work together to gain a deeper understanding of users’ needs and wants in their physical, socio-cultural and personal environments. This enables us to*

design highly customerized solutions that address the complexities of people's lives at a particular time and in a particular space." (Philips Design 2003, p.18)

According to the VIP approach presented by Hekkert and van Dijk (2001) the starting point for defining the context is the user-product relationship.

"This context consists of all kinds of factors, e.g. social patterns, technological possibilities, and cultural expressions, that affect the way people perceive, use, experience, respond and relate to products, i.e. the nature of the human-product interaction." (Hekkert & van Dijk 2001, p.3)

Hekkert and van Dijk elaborate with examples of how demographics, politics, culture, society and technological infrastructure over the years change the fundamental circumstances of the user-product relationship. Even though the starting point is the micro-level, the definition of the context quickly points towards macro-level factors, which is also a common approach in future studies.

Vijay Kumar also believes that the objective is to create products that have a good fit with users. Herein, the focus should be on what people do – their behaviour, activities, needs, and motivations (Kumar & Whitney 2007). In particular focusing on experiences is claimed to lead to new innovations that are firmly grounded in people's daily lives. Kumar proposes investigating experiences from five perspectives: physical, cognitive, social, cultural and emotional (Kumar 2009).

However, the focus on users' activities and experiences should be complemented by an understanding of new innovations as part of an overall system with many interconnected parts. For this purpose Kumar has developed a systems-thinking framework which consists of Flows, Attributes, Relations, and Entities (FARE). The FARE framework is not meant to define the boundaries of the relevant context, but to give guidance to how a given context may be unfolded in different dimensions from a systems-thinking perspective.

Product ecology

Most user-oriented designs have been conceived as interaction between one product and one user. However, as the focus is being broadened to give meaning to activities in a given situation, we need to study the relations of systems of products and groups of people, i.e. the product ecology (see Figure 8.9).

"The functional, aesthetic, symbolic, emotional and social dimensions of a product, combined with other units of analysis, or factors, in the ecology, help to describe how people make social relationships with products. These include the product; the surrounding products and other systems of products; the people who use it, and their attitudes, disposition, roles, and relationships; the physical structure, norms and routines of the place the product is used; and the social and cultural contexts of the people who use the product and possibly even the people who make the product." (Forlizzi 2008, p.12)

The product ecology is a theoretical framework that aims to describe the social use of products and how products evoke social behaviours (Margolin 1995; Pantzar 1997; Dourish 2001). It is inspired by social ecology theory and assumes that human behaviour is adaptive to an external environment, and that the relationship between the two is complex and dynamic.

Other contexts

However, the context of a product can be unfolded in many other dimensions. For example one may consider all the elements of an offering. An offering is not only the product, but a part of an integrated system which

among other things encompasses product/service systems and business models (Manzini 2004; Morelli 2006; Doblin Research 2009). Another popular approach – particularly in marketing – is to consider the consumer's needs as derived from a person's lifestyle. The product may also be considered in relation to different market segments or as part of an organisation's image. In fact there are as many potential perspectives on a theme and its context as there are fields of research and paradigms within them.

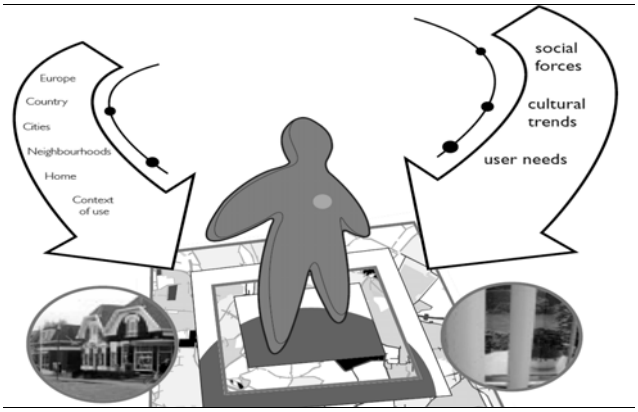

Figure 8.8: Model of context in HiCS project (Philips Design 2003)

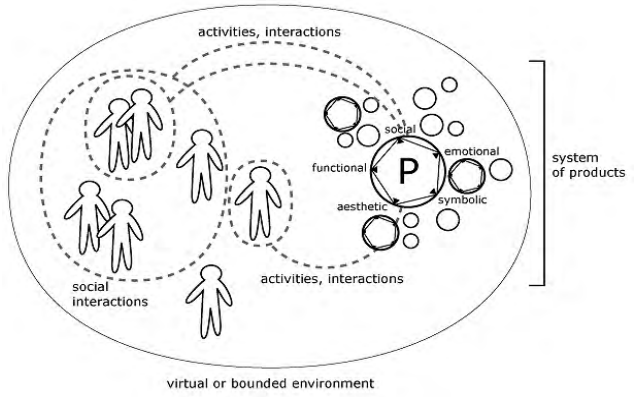

Figure 8.9: Overview of the Product Ecology. (Forlizzi 2008)

In this review we have emphasized the user-oriented approach as this is most relevant for connecting new offerings with the effect on everyday activities. But it should be noted that once one attempts to understand the potential of radical innovation it is often relevant to include other perspectives on the context.

Transformation and translation

It is a given from the definition of the innovation map that new offerings, i.e. products, services, solutions, etc., are the object of design, while everyday activities is the unit of analysis. However, as we have seen in the review there are many possible ways of defining the content and context of these concepts. The definition has a profound impact on the unfolding of the manifest and the overall exploration of alternatives, so this is an important part of the experimentation. For the time being we will only define some essential concepts.

The most fundamental concept is the 'domain' which identifies a certain scope and level of analysis. A domain may comprise products, activities, situations, macro-level factors, etc. In relation to describing the innovation space, the term 'dimension' can be interpreted as an axis that goes through the space, while the domain has a limited extension in one or more dimensions.

Domains are not inherently defined as focus or context, but may be assigned such denominations in relation to a particular theme or model. The unfolding of the content around the focus point and the wider context is often a difficult task, because factors are interrelated in a web-like structure and therefore seldom appear in a simple onion layer formation (See Figure 8.10).

The appropriate investigation of individual domains and their integration across domains are of key importance for the quality of the resulting outcome and the moves between different domains are often directly expressed in the overall innovation process. In a scenario process there are two types of moves between domains: translation and transformation.

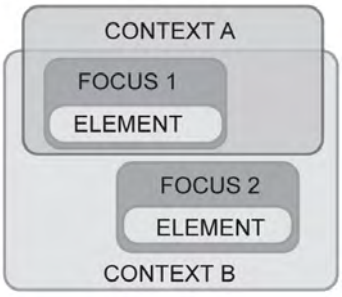

Figure 8.10: Unfolding context of focus domains.

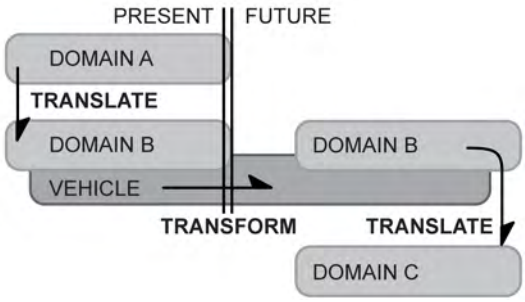

Figure 8.11: Transformation and translation of domains from the present to the future.

Translation takes place when the situation in one domain is projected onto another domain – for example, when investigating the everyday context based on a particular product or – the other way around – when exploring innovation opportunities within a given everyday context. Translation typically moves across the divide between focus and context.

Transformation takes place within the same manifest domain, but uses a vehicle for extending the scope of the domain. The vehicle may be a type of analytical or value-based abstraction which guides the transformation. For example, when performing an analytical interpretation the abstraction of trends enables the transformation of the present everyday into the future everyday.

The overall process may use several combinations of translation and transformation to explore the full innovation space (See Figure 8.11), and may even reiterate the moves to gradually develop a coherent and relevant space.

8.4 ANALYTICAL INTERPRETATION

The increasing rate of change in society has made it all-important for organisations to foresee change in the environment. Foresight was to begin with based on intuition and enlightened gurus, but today there is a broad range of analytical models available for professionals.

Trend analysis

A trend is a line of general direction of movement, a line of development, a prevailing tendency or inclination, an emerging style or preference, or the general movement over time of a statistically detectable change (Merriam-Webster 2010). In short, trend analysis assumes that the future is an extension of the past. It looks for patterns in information and extrapolates those patterns into the future (Higham 2009). Extrapolation of trends requires the analyst to understand the factors which contributed to changes in the past, and have confidence that those factors will continue to influence future developments.

The factors analysed for trends depend on the object of study. From the outset, futures research was mainly concerned with macro-level developments. It is widely acknowledged, with little variation, that in such contexts it is relevant to study political, economic, socio-cultural, technological, environmental and demographic factors. Also known by the acronym 'PESTED' factors. The emergence of consumer research in the 1980s lead to a different breed of trend research which focuses on relatively short-term changes in consumers lifestyles and ways of life that will change. Rather than policy-making, this type of trend research targets the research and development departments of innovative companies which strive to meet consumers' needs and help them conceptualize new products. The trend researcher

Matthias Horx distinguishes between four levels of trends: global mega trends, socio trends, consumer trends and design trends. It is implicitly assumed that these levels of trends are hierarchical and the first influences the subsequent trends.

Modern consumer-oriented trend research collects new trends and insights to consumer's needs, perceptions, and opinions through a number of techniques. Professional trendspotters travel the world and look for trendsetters that influence their surroundings. Focus groups are held to reveal consumers' true opinions. Market research databases show patterns in consumption. The trend agencies are increasingly using the web to liaise with amateur trendspotters and trendsetters and access up-to-date news from any corner of the world.

Often the environmental analysis produces a large number of trends which subsequently must subsequently be filtered and further analysed to produce a suitable outcome. For example, cross-impact analyses and morphological analyses take into consideration the synergy between individual trends. Environmental analysis is used to increase the reliability of forecasts and to identify viable combinations. Due to the large amount of possible combinations the analysis is often conducted by specialized software.

Trend research is inherently blind to sudden discontinuities and is therefore often supplemented with a different class of concepts that may take into account sudden events which are often decisive for change. Unexpected events may be referred to as 'wildcards', 'surprises or 'discontinuities'. The concepts express unexpected events with a high degree of risk, which exceeds the pre-existing awareness of uncertainty which may be expected from looking into the future.

In relation to scenario building trends serve as a foundation for constructing scenarios. It is important that the trend analysis is as thorough as possible in order to identify and assess impacting factors and provide the best possible conditions for developing scenarios

Driving Forces

In the context of scenario building, Schwartz (1991) uses the term 'driving force' as a conceptual tool to understand the underlying reasons for change. Essentially, a driving force is a factor which keeps current practices going. Subsequently, the potential forces which can influence driving forces to change are identified and these elements are further divided into 'predetermined elements' and 'critical uncertainties'. By weaving together these conceptual building blocks a deeper understanding of the dynamics and patterns is obtained, providing a scaffold for constructing scenarios. The overall aim is to end up with just a few scenarios which will inform the decision process rather than confusing it. In this regard it may be necessary to rank key factors and driving forces according to their impact and likelihood in order to isolate the two most significant forces (i.e. 'scenario logics') that clearly communicate the future options.

The driving forces are assumed to be rooted in the same macro-level PESTED factors as trend-analysis, but dig one level deeper and reveal the factors and forces which determine trends (See Figure 8.12).

Deepening

The analyses of trends and driving forces both seek to identifying the underlying logics of the immediate apparent events. The iceberg model (Figure 8.12) is used in systems theory to illustrate the logic of this thinking. Events in this model are the tip of the iceberg which is above the water. They are what can be seen and immediately perceived around us. Events

dominate the mainstream news, but do not reveal the causes, thus limiting understanding of the issues at hand. When events are put in relation we begin to recognise recurrent patterns of events and trends, which take place under the waterline. The human mind is good at recognizing patterns, which are the starting point of foresight. Deep beneath the patterns are the underlying structures which drive the trends. This is where the driving forces and scenario logics reside. At each level the immediate complexity collapses and the ability to foresee the future increases.

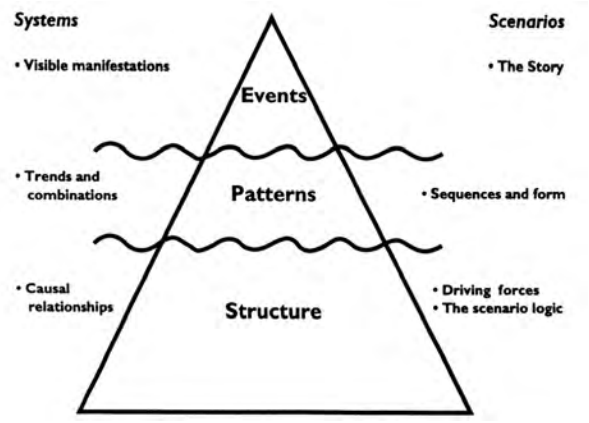

Figure 8.12: The iceberg model. The analysis of driving forces reveals the underlying factors of trends.(Schwartz & Ogilvy 1998, p.68)

The concept of trends is rarely challenged, but there are a few critical voices who accuse it of distorting reality and lacking depth. The German futurist Klaus Burmeister (2006) suggests that trend-based thinking should be substituted by – or eventually be complemented by – context-based logic. The argument goes that in order to create a thorough understanding of the world, we need to understand the interaction of technology, products, consumers, business models and social dynamics which define the context. That will enable a more profound exploration of innovation opportunities.

> *"Context-based thinking allows for the recognition and assessment of real-life innovation opportunities, ignoring hyped trends." (Burmeister 2006, p.3)*

Critical Futures

Another class of futures methods to deepen the understanding of change comes from a critical view on the mainly Western military or industrial background that the most popular methods are based on. These popular methods implicitly promote a uni-dimensional view of the world and do not incorporate modern insights from the field of social science about people and cultures. The critical futures methodologies seek to bring a multi-layered and multi-perspective, value-oriented approach into futures studies. It moves debate beyond the superficial and introduces a social analysis in line with postmodern relativism and global ethics. The approach includes a deeper understanding of socio-cultural background, a participatory approach to engage those affected by decisions, and an examination of the underlying worldviews, values and impacts of actions.

The causal layered analysis is a central methodology for deepening the understanding of society (Inayatullah 1998). It is best used before scenario building because it opens up a vertical space for scenarios. Instead of broadening the future as most methods aim to do, it deepens the understanding. The method has four levels:

1. Litany
2. Social causes
3. Structure and worldview
4. Metaphor and myth

The litany is commonly accepted ideas about how things are and should be. At this level problems may be solved by simple trouble-shooting. The second level is 'social causes' and focuses on social, economic and political factors which give rise to issues. Moving one level deeper, we can consider the underlying structures and question the worldview that we use to perceive certain problems and solutions. Finally, the fourth layer deals with the unconscious and mythological in human cognition.

Experts and the Delphi technique

The delphi technique relies on the informed intuition of experts and mainly target the field of policy-making for complex cross-disciplinary problems. Its objective is to generate the most reliable consensus among a group of experts. It obtains this through a series of questionnaires. The approach is designed to avoid the kind of psychological pressures and group-thinking which usually occur in open-forum discussions.

Helmer (1983) describes an experiment in which a panel of seven experts were given five questionnaires at approximately weekly intervals. The first and third questionnaires were followed up by interviews with each expert. An important part of the technique is to identify the reasons for disagreement among experts and to assert if discrepancies are due to factual differences, semantic interpretation, or theoretical foundation.

Experts and self-proclaimed gurus have had a prominent role in the history of futures studies. Alvin Toffler and John Nasbitt presented the mega-trends of the 1970s, while Faith Popcorn predicted consumer trends in the mid 1990s. However, in recent years the field has been democratized to the wider public with the growth of collaborative trendspotting networks on the internet and the spread of trend analysis techniques.

The expert-driven is, by nature, neither transparent nor participatory, so in relation to the objectives of making the innovation map, it is not a suitable methodology.

Vision in product

The 'Vision in Product' (VIP) is a method developed in the field of design in the mid 1990s. The method envisions new products by creating a vision of a new relationship between a future product and a future environment (Hekkert 1997). It consists of three movements in the design space (See Figure 8.13).

Firstly, the context of a product is unfolded. It is herein assumed that it is only through relations to people that a product has any meaning and value, so the first level of context analysis focuses on 'interaction'. At this level the affordance, meaning and experiences of a product are described. The second level of context analysis encompasses all the factors which affect the scene of interaction, such as social, technological and cultural factors.

The second movement is about moving from the past to the future. Hekkert (1997) suggests that there are three approaches to forming a future context. The first approach assumes that a current need is not satisfied and requires a new context to be remedied. Alternatively, the starting point may be an intent to change the world for the better and pursue social, cultural or environmental values. Finally, the future context is envisioned by analysing trends and developments.

The third and final movement in the design space transforms the vision of the future context into a concrete proposal for a new product. Essentially, it is a movement that goes in the opposite direction as the first movement, but instead of deconstruction, it is now a phase of designing.

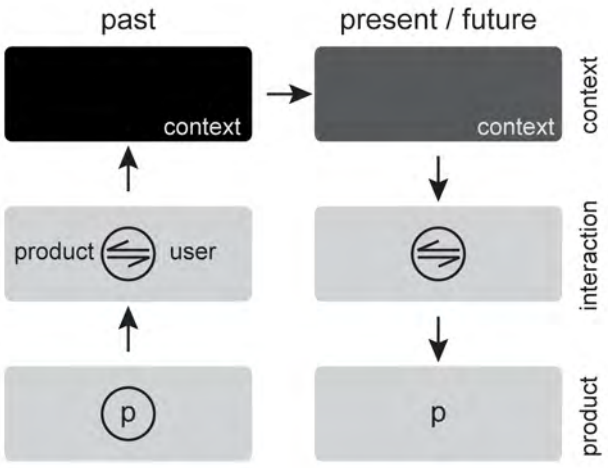

Figure 8.13: The Vision in Product Model. (Hekkert 2003)

The bridge model

It is widely acknowledged that designers go from analysis to synthesis – from current situations to preferred futures – by moving up a level of abstraction. It follows that many models divide the design space along two axes defined by concrete/abstract and analysis/synthesis (Dubberly et al. 2008; Kumar 2009). The bridge model is an example of this type of model (See Figure 8.14). It is organised as a two-by-two matrix, where the horizontal axis separates concrete from abstract and the vertical axis divides analysis from synthesis. The design process starts in the lower left quadrant with the observation of the users, situation and context. The next move enters the abstract upper domain, where the observations are interpreted and insights framed. Abstract mental images are formed from the patterns observed in reality. Based on the interpretations and patterns it is possible to generate alternatives. Hereby, the process proceeds to the upper-right quadrant. The alternatives are inspired by hypotheses and speculations with relation to the abstract interpretations and models. Finally, the abstract models give rise to prescriptive modelling and the development of concrete concepts for future proposals.

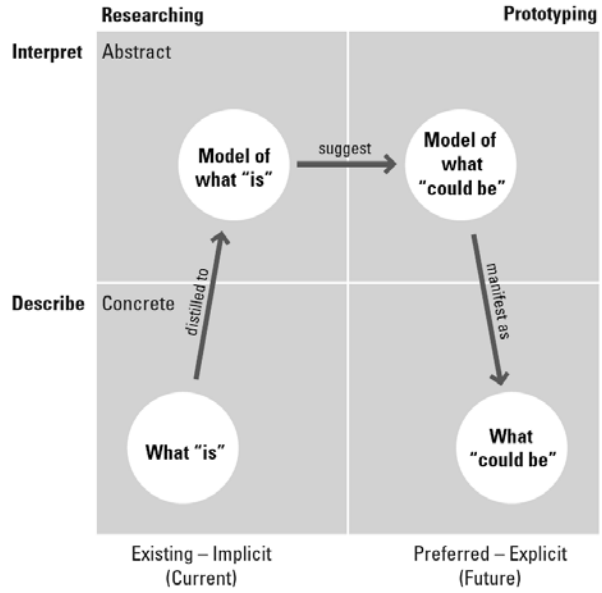

Figure 8.14: The bridge model. (Dubberly et al. 2008)

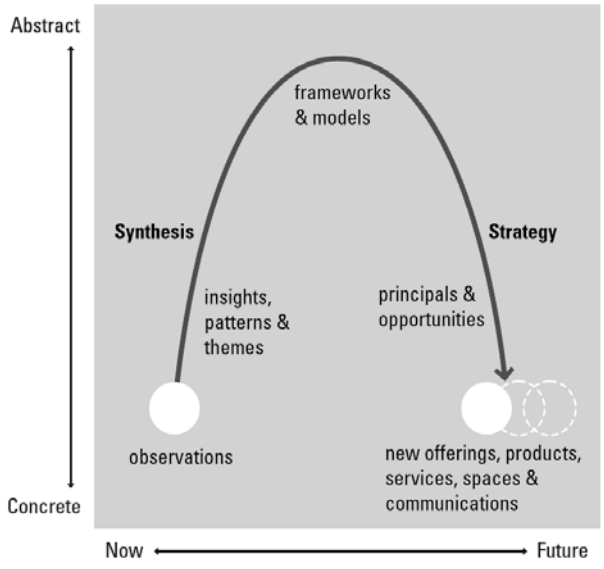

Figure 8.15: Suri Fulton / IDEO model. (Dubberly et al. 2008)

Jane Fulton Suri has presented an elaborated model which incorporates three levels of abstraction. The main axes remain the same as in VIP and

bridge models, however 'frameworks & models' are placed at the top and link the analysis of patterns and the principles for designing new offerings.

8.5 VALUE-BASED VISIONING

Visioning is more than a creative and imaginary exercise. An effective visioning process is emotional, intellectual and existential (Senge 1990b). It is rooted in an individual's own set of values, concerns, beliefs, and aspirations. The identification of those opinions and the translation into shared visions is a complicated endeavour and requires a structural and systematic process.

The main reason for value-based visioning is that it generates a larger and more relevant space of opportunities than a simple exploration of possible alternatives. Decision theorist Ralph Keeney states *"that value-focused thinking has significant advantages over alternative-focused thinking for both identifying decision opportunities and creating alternatives"* (Keeney 1996, p.29). The argument is that by focusing on higher objectives a broader strategic decision context comes into view. Thereby one bypasses the specific context and its limitations.

Lerdahl (2001) proposes developing provocative visions and goal visions as a means to create new solutions. The provocative visions function as a mental laboratory with tools for conceptualisation and expansion of the solution space. The goal visions are inspired by the provocative visions, but contain the desired abstract qualities to guide the development of new solutions. Both types of visions contribute to the development of new, radical compelling solutions and situations (See Figure 8.16) which may subsequently be related to the present with backcasting techniques.

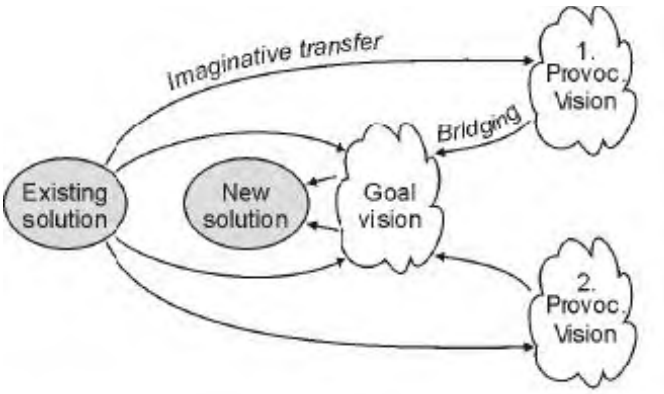

Figure 8.16: Visioning and backcasting as a means to develop new solutions. (Lerdahl 2001, p.278)

Figure 8.16 may also explain why visions are perfect states which may never be reached and which one never achieves.

> *"Successful visions fulfil three criteria: They are timeless, inspirational, and provide clear guidelines for decision making. A vision is far-reaching; it describes a utopian place where everything is perfect. You might never arrive at your vision, but arriving isn't the important part; it's trying to get there and continually improving that matters." (Latham 1995, p.66)*

The inventor of the World Wide Web, Tim Berners-Lee, had a vision of a collaborative network, much like the neural connection in the brain (Korac-Kakabadse & Kabadadse 1998). Even though the internet has come a long way it has not yet been possible to implement his vision of an integrated 'browser-editor' facility, so the vision may still inspire new developments.

The visioning process produces imaginary alternative worlds, but not everyone agrees that they should be as idealized as utopias. Margaret Mead

(1957) observed that utopias are not vivid enough to lead towards practical solutions. To Senge (1990a) the gap between the current reality and a vision serves as a rubber band of 'creative tension' for driving change. It follows that if the gap is too small there is no traction, while a too large gap may break the rubber band.

Future studies are often normative, yet there are notably few contemporary futurists who have made a contribution as to how to arrive at a value judgment (Bell 1997). The collection of relevant models therefore comes from a variety of fields, such as organisational learning, spiritual development and creativity studies, and only in the past 10-15 years has been applied to the field of design and innovation.

The common denominator is the value-based search for 'meaning' that distinguishes visioning processes from the analytical models and purely creative exercises. To some scholars this search takes an inner spiritual direction while others emphasize the more objective characteristics of the proposed solutions. In the following the most popular and relevant models are presented.

Theory U

The maxim of Theory U presented by Scharmer (2009) is to let go of the past and conventional thinking patterns and tune-in to the emerging future in the present to find direction for strategy and action. In his view, organisations much too often try to solve modern complex problems with yesterday's mindset. To activate the full potential there are three basic conditions that must be met: an open mind, an open heart, and an open will. The three conditions of openness give access to new intelligences which have to be nurtured and cultivated to create the best possible future. It requires us “to shift our level of operating from the outer to the inner circles of (self-) causation.” (Scharmer 2009, p.373)

The inner process of 'letting go' is not easily achieved, but is key for creating new visions and performing in a complex environment. The process consist of five steps:

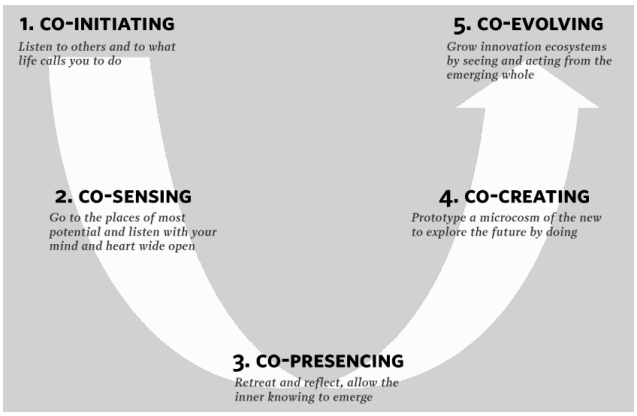

Figure 8.17: Theory U. (Scharmer 2009, p.378)

The deeper the levels in the model, the more likely are profound innovation and change. Thus problems are not solved merely through reacting and redesigning, but are reframed.

Future search

Future search is a participatory process which seeks to create a common ground and a shared vision of the future (Weisbord & Janoff 2000). The process takes place at a conference which spans three days and typically involves 60 to 70 people who are stakeholders in the particular theme. It is important that all views are represented for the process to succeed. The conference is set up to create the best possible conditions for sharing views

and accepting polarities. All participant have the same status and no keynote speakers are invited. Another important aspect is the focus on common grounds and the future, rather than problems and conflicts. The aim is not to remedy perceived deficiencies, but to reveal a potential which already exists.

The three-day process involves five steps:

1. Review the past
2. Explore the present
3. Create ideal future scenarios
4. Identify common ground
5. Make action plans

The principles of the future search process is being used by design consultancies for challenges with a social action component (Ames 1993). For example, the Index 2005 conference in Copenhagen used a very similar process facilitated by the design consultancy Idea Factory.

Futures wheel
The futures wheel quickly determines the first, second and third order consequences if an event were to occur in the future. The starting time is the centre of the 'wheel', while the 'spokes' indicate a number of possible developments. The further removed from the centre, the more fundamental is the change. Conventionally, the radiating dimension is conceptualized as removed in time, but it may equally well be understood as a scale of concept or level of intervention ambition.

The method is often used as a participatory exercise and bares a strong similarity to mind-mapping techniques. Combining the participative approach with a morphological analysis may throw light on unacknowledged areas of investigations that participants do not want to consider but which are nonetheless important for developing a comprehensive overview.

Value-based product vision
Lerdahl (2001) finds that the VIP method is an important contribution to design methodology but believes that it should incorporate a deeper reflection on spiritual issues, such as underlying values, identity, myths, intentions and purpose. For this purpose Lerdahl (2001) seeks to further develop the value-based approach of forming the future context and proposes a vision-oriented methodology. The model consists of four levels which connect abstract values with the concrete kinaesthetic and visual properties of a product:

1. **Spiritual**
   This level describes the intention of a product and its underlying values and philosophy.
2. **Contextual**
   The context is the environment and social setting of the interaction with the product.
3. **Principal**
   The principles and concept of a product are described in terms of constructive properties.
4. **Material**
   The lowest level in the hierarchy describes the details of construction, material and production.

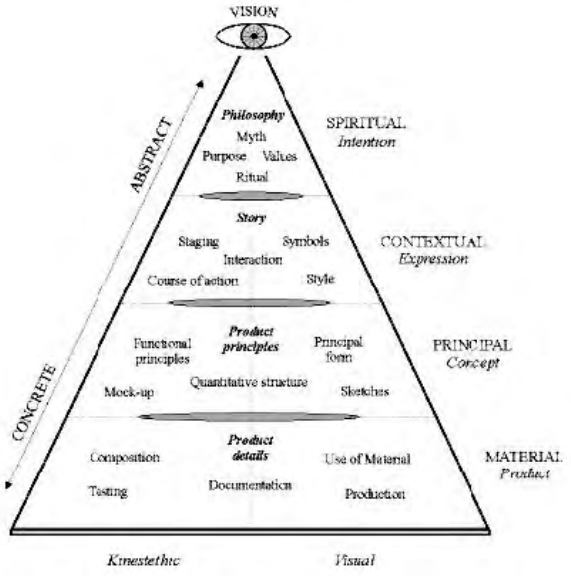

Figure 8.18: The Pyramid Model. (Lerdahl 2001)

The model is an integrated element of a proposed development process. The process starts with an analysis of a trend in the context and then continues by working down the pyramid model in two stages. The first vision-based stage develops a value mission, an interaction mission and some initial concepts. The second specification-based stage refines the concepts and presents a development plan.

In addition to the pyramid model, Lerdahl proposes making use of metaphors and visualizations as a means to enrich the innovation team's communication and not only rely on keywords. Inspiration as to how this may be conducted can be taken from the Danish innovation consultancy Visionpool which uses a large set of thumbnail-like images in their vision building process (See www.visionpool.dk).

THE STUDY

The central part of the thesis is the study itself. It begins by presenting the thoughts that went into the set-up and execution of the research in the chapter, “Research Approach.” It explains the particular characteristics of this research project and discusses how to meet the requirements of both practical relevance and scholarly rigour. A detailed research method is presented and the criteria for producing research of high quality is discussed.

Hereafter the material generated by the research process is described in detail. It consists of four iterative research cycles that are presented in the respective chapters titled, “Research Cycle 1,” “Research Cycle 2,” “Research Cycle 3,” and “Research Cycle 4.” Each research cycle adds to the accumulation of knowledge that eventually may provide answers to the research questions.

9 RESEARCH APPROACH

In the previous part of the thesis I have described the professional and theoretical context within which I will develop a framework. In this chapter I look further into how we will model a framework within this context. I will start by reflecting on the type of research and the philosophical background. This is important for this study, because it legitimises the research strategy and gives directions for how to evaluate the quality of the research.

9.1 APPLIED RESEARCH

The goal of this research is to produce knowledge for solving real-life problems and is typical for 'applied research'. It distinguishes itself from other applied research by its focus on the modelling of a framework and the intention to improve innovation practice. Verschuren (1999) calls this type of inquiry 'practice-led design-oriented research'. The overall purpose of practice-led research is about intervention in order to change an existing practical situation. It consists of the following elements: problem finding, diagnosis, design, intervention and evaluation. The elements are interlinked but very different in their research objectives, so Verschuren recommends that a research project contribute to only one element of this intervention cycle in order not to bite off more than one can chew in a research project. In this research we focus on modelling, which in the vocabulary of Vershuren, is a type of 'design'. However the problem and diagnosis is only determined on an overall level in the introduction and pre-study, so the study will investigate these as a part of the modelling of the framework. The stages of intervention and evaluation are not considered in this research.

Figure 9.1: The double hurdles of applied research.

Theory versus methodology

Applied research may be inspired by or grounded in scientific or pure research but it does not produce scientific knowledge itself. To applied research, theories are merely tools that may be used on a needs basis. Because applied research resides in the fuzzy real world, the strict scientific protocols must be relaxed. Technology and design research is oriented towards practical purposes, so in many aspects they are examples of applied research. We will not go into an argument about the overwhelming similarities of the three labels for the research in this study, but simply claim that there is a convincing overlap.

There is a great deal of inconsistency in the use of the terms science, research, theory and methodology in academic literature. The distinction between pure science and applied research clarifies when to use which term. Applied research does not create theory but methodology. There is thus no applied 'science' even though many researchers strive to incorporate scientific standards into their research. In this way there is a spectrum of research which occupies different shades of the two extremes. To further

elaborate the position of this study, we will argue that the scientific study of the phenomenon of 'applied research' is a science, which is often mislabelled. It implies that the term 'design science' is more correctly labelled 'science of design'. Many researchers are educated in the field of scientific research and therefore bring vocabulary and scientific ideals into the field of applied research, such that methodology is often mistaken for theory. In this study we will attempt to keep a clear line between the two, so that the term 'theory' is only used in relation to science.

9.2 PHILOSOPHY

The modelling of a methodological framework for vision projects is a conceptually challenging form for research as it contains two interconnected knowledge-creating projects. Both the research project itself and its object of study – the vision project – are about intervention and the exploration of a potential by providing concrete proposals. The methodological framework is used in group process, i.e. the vision project, and the immediate objective is to change these work process. One may also say that the objective is to 'model' or 'design' a new work process.

In principle there is no difference between this research project and the type of design projects in which the objective is to design an IT system or a new production system (Poggenpohl & Sato, K 2003). In order to design a production system that produces quality output it is necessary to consider the characteristics of the object that is being produced. Surely, two different types of objects will have different production systems. Likewise, in this research project, we must take into account the characteristics of the knowledge that is being produced in the vision project, when we model the methodological framework. To understand the characteristics of the knowledge we must investigate the knowledge creating paradigm associated with vision projects. That is to say we must investigate how reality is conceived in vision projects and the ways to create knowledge about it. This implies that the research project contains two domains of reality:

- The **external** 'real' world that is explored in the search for innovation opportunities. The purpose of a vision project is to create knowledge about possible and desirable alternative situations grounded in an understanding of the external 'real' world. It focuses on innovation opportunities and how they form part of the greater context of everyday life and society. The assumptions about the external world are therefore important for the purposeful exploration of alternatives.
- The **internal** project context in which an innovation team makes use of the framework. The knowledge is created in a group process with the support of a methodological framework. The internal project context is the empirical subject of investigation in this study as it is where the framework is being interpreted and guides the construction of the innovation map. The assumptions about the internal project context are decisive for how we can learn about the functioning of the framework and the development of the content of the innovation map.

Only by combining the internal and external study can we understand how to model the methodological framework in order to improve the innovation map of vision projects. The conceptual challenge is that the internal and external study are knowledge creating projects in themselves and are based on their respective paradigms about reality and knowledge. In order to understand all the assumptions that go into the modelling of a framework we will therefore present the research paradigm as an internal and external paradigm.

Textbox 9.1: Design methodology and research methodology

To avoid any confusion it may be useful to note that the research object of this study is indeed another knowledge creation process – the vision project. The two knowledge creation processes are both driven by a set of methods and share many other structural commonalities. It is therefore important to distinguish between the design methods used in the vision project to create knowledge about how an organisation may act in relation to its environment, and the research methods used in this study to learn about how to structure the activities in a vision project. To clarify the difference we will only use the term 'framework' in relation to design methodology.

Internal project context

The study of the project context can reveal both the 'fitness' of the methodology and its effect on the navigational characteristics of the innovation map. It is therefore a central object of this study to understand how the proposed methodology is understood by the team members and how it influences the creation of the innovation map.

It is not a given that the methodology is interpreted by the team members as the researcher intended. The methodology strives to structure and coordinate the thinking of all team members on a conceptual level, but the team members may interpret the methodology differently. Their interpretation depends on the members' pre-cognition, but may also be shaped by the interaction with other team members. Thereby they may align their interpretations and construct a shared mental image of the methodology.

The creation of the innovation map is also a cognitive effort. The process may be supported by drawings, diagrams, text and other materials, but the knowledge of alternative innovation opportunities is first and foremost a cognitive construction shared by the team members. It is therefore central to investigate the interpretations and phenomena that take place in the mind of the team. Herein, we assume that the social world is not a given: it is not something ‘out there’ that exists independently of the thoughts and ideas of the people involved in it. Cognitive phenomena are not the same as external reality, whose laws can be discovered by scientific research and explained by scientific theory as positivists and behaviourists argue. It is a socially constructed reality, a continuous, dynamic process which is performed by people acting upon their interpretation and knowledge of it.

These assumptions are also found in social constructivism. Social constructivism seeks to uncover the ways in which individuals and groups construct their own perceived social reality. It looks at how groups of individuals communicate and negotiate their views and perspectives regarding individual,shared or inter-subjective reality (Young & Collin 2004).

In the endeavour to investigate the cognition of the team members we can borrow from the phenomenological tradition. Phenomenology is concerned with the systematic analysis of the structures of consciousness. It analyses social phenomena on the basis of people's own perspectives and descriptions of the phenomena.

Knowledge and truth

In the social constructionist’s view, knowledge and truth are created, not discovered, by the mind. It emphasises the plastic and pluralistic character of reality – plastic in the sense that reality is stretched and shaped to fit pur-

poseful acts of intentional human agents, pluralistic in the sense that reality is expressible in a variety of symbol and language systems. It means that the study of the project team cannot be objective and produce a singular truth.

It calls for an empirical and qualitative research strategy. We have chosen action research as an appropriate method because it allows interaction with the project team during an experiment and enables the researcher to gain an in-depth understanding of the ongoing sense-making of the proposed framework.

Furthermore, action research allows the researcher to modify or explain the framework during the experiment, so that it is interpreted in a specific way. Hereby, we can separate issues concerning the interpretation of the framework and the effects of the framework. The intervention also allows for modifications of the framework to take place, so that sub-hypotheses may be tested, thus speeding up the learning process.

External world

The vision project explores and maps radical innovation opportunities. The resulting innovation map is used by organisations to guide their efforts towards sustainable innovation. The scenario methodology is, like design methodology, based on an assumption of purposeful intervention which is best encompassed by critical realism (van der Heijden 2000; Bunge 2003). Critical realism assumes that there is an objective world, which nevertheless is open to different interpretations. It is not believed that there is one correct interpretations, but that a better understanding of reality can be obtained via the triangulation of multiple interpretations.

In order to intervene purposefully, we must be able to understand and identify the structures that shape the world. These structures are not immediately evident in the observable pattern of events, but can be identified through the practical and theoretical social sciences (Bhaskar 1989).

In total, critical realism distinguishes between three different domains. The real domain consists of underlying structures, mechanisms and relations. The mechanisms belonging to the real domain may cause patterns of events, while the relations generate behaviours in the social world. The actual domain consists of these events and behaviours. The empirical domain is where the experienced events reside.

Bhaskar (1978) explains that; *"…real structures exist independently of and are often out of phase with the actual patterns of events. Indeed it is only because of the latter we need to perform experiments and only because of the former that we can make sense of our performances of them."* Critical realism implies that the real world is ontologically stratified and differentiated and that it consists of a plurality of structures and generative mechanisms which cause events to occur – or not occur.

Critical realism, pragmatism and design thinking

Within the critical realist paradigm there is an openness to exploring different theoretical perspectives. Bhaskar (1978) argues that there is a virtue in directing a substantive field of empirical inquiry based upon a spectrum of ontological perspectives which can guide the inquiry in a theoretically non-restrictive manner. In this way the critical realist accommodates a pragmatic approach. The central tenet of a pragmatic approach is that the worth of a method or theory is to be judged by the consequences of accepting it. Thus, the pragmatist makes purposeful use of propositions, methods or theories and questions whether they are useful in practice *"in the sense of helping*

people to better cope with the world or to create better organizations" (Wicks & Freeman 1998, p.129). These theories may be derived from different ontological stances, so in the process of incorporating different theories, there is also a clarification of ontology taking place. The critical realist perspective is a spacious foundation which can be extended by more specific perspectives. The emergent ontological assures that the most competent perspective is used to solve the given problem.

	Positivist	**Postpositivism**	**Constructivism**
Ontology	naive realism – 'real' reality but apprehendable	critical realism – 'real' reality but only imperfectly and probabilistically apprehendable	relativism – local and specific constructed realities
Epistemology	dualist, objectivist; findings true	modified dualist/objectivist; critical, tradition/community; findings probably true	transactional/subjectivist; created findings
Methodology	experimental/manipulative; verification of hypotheses; chiefly quantitative methods	modified experimental/manipulative; critical multiplism; falsification of hypotheses; may include qualitative methods.	hermeneutic, dialectical
Validity	findings true	findings probably true	created findings

Table 9.1: Basic beliefs of alternative inquiry paradigms (Guba & Lincoln 1998, p.109).

The pragmatic approach to sampling and making use of theory is a core component of design thinking. In this study, it is a central element in the development of a new methodological framework, as we will try to integrate new theories and methodologies and must learn how to combine them into a powerful and yet flexible framework that can adapt to the concrete subject matter.

9.3 PROCESS

The modelling of methodological frameworks is common place in design research. In particular we can find inspiration for structuring the research framework from the field of engineering design which has a long tradition for modelling methods. Blessing and Chakrabarti (2002) propose a Design Research Methodology (DRM) which builds on learning from a number of earlier models. The research method is tailor-suited for prescriptive research which seeks to change the practice of design by normative measures. Given that this study seeks to prescribe a design-led scenario-based methodology it is assumed that the DRM is also relevant for it.

The Design Research Methodology consists of four stages:

_ **Criteria definition**
The criteria definition stage is about finding links between the research problem and success. These criteria are important for focusing the research. In the pre-study we have determined that the innovation map should be navigational as defined by these three desired qualities: comprehensive, transparent and fluid.

_ **Descriptive study I**
The descriptive study I seeks to identify and understand the factors that influence the criteria. This is important for providing a foundation for developing a new methodology framework. In this study, the descriptive study results in a hypothesis which suggests that the desirable characteristics can be improved by making a certain type of correction to the framework.

_ **Prescriptive study**
The prescriptive study develops a methodology which improves the design process based on the assumptions of the proposed issue. A basic process has been developed in the pre-study, so the objective is to develop a complimentary methodological approach and present a working prototype of an integrated framework.

_ **Descriptive study II**
The descriptive study II evaluates the proposed framework to find out how it affects the desirable characteristics and suits the project context it is intended for. In this study, the evaluation is done through experimentation in real-like circumstances.

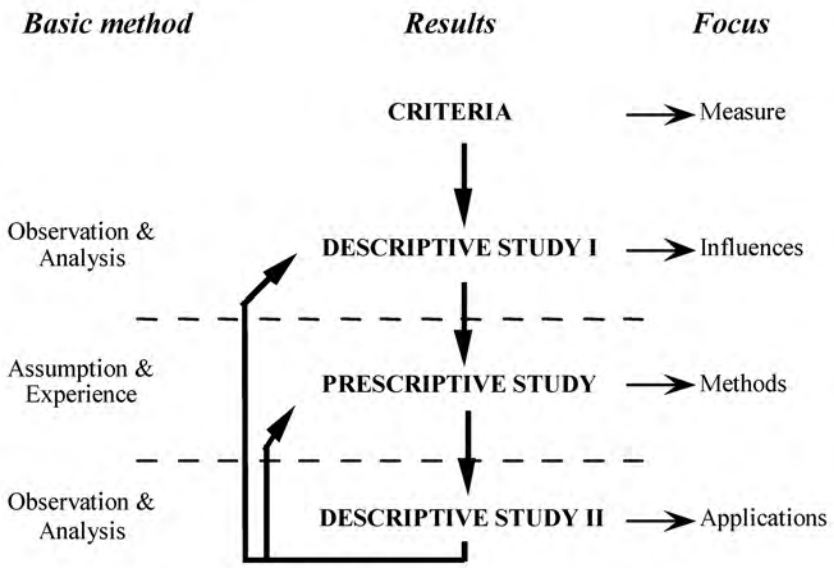

Figure 9.2: Design Research Methodology. (Blessing & Chakrabarti 2002)

Experimental learning

The research method presented by Blessing assumes that the study concerns incremental improvements to existing methodologies based on measurable criteria. However, this study is not guided by a specific problem or particular issue but by the intention to significantly improve the desired qualities of the innovation map which cannot be easily measured. It further adds to the complexity of the study that we retain an inquisitive attitude to the understanding of the issue and seek openly for new methodology approaches with big potential to increase the quality of the innovation map.

Due to the overall complexity it is infeasible to 'prove' in a positivist sense the effect of a methodological approach. Instead we must build an understanding of the issues and potentials within the concrete project context through iterative cycles of experimental learning and hopefully accumulate sufficient insight to make a concrete recommendation for a new framework.

Kolb (1984) defines experiential learning as *"the process whereby knowledge is created through the transformation of experience. Knowledge res-*

ults from the combination of grasping and transforming experience." Kolb's Experiential Learning Theory consists of a cycle with four phases:

1. Concrete Experience
2. Reflective Observation
3. Abstract Conceptualization
4. Active Experimentation

The learning cycle begins with an experience, followed by an opportunity to reflect on that experience. Then we can conceptualize and draw conclusions about what was experienced and observed, leading to future actions in which we experiment with a different intervention. That begins the cycle over again as we have new experiences based on experimentation

In relation to this study the Experimental Learning Theory and DRM are complimentary. The overall research strategy is to build knowledge through a number of cycles of experimental learning, but if we want to understand in more detail how to perform each of these cycles, we must look to the DRM for concrete guidelines. Blessing also suggests that iterations of the DRM should take place, but notes that it is more likely to be divided into different research projects, since most studies do not complete a single research cycle. However, in this study we are dependent on building knowledge on several levels and will therefore perform several iterations. This is possible since we take a more relaxed attitude to the experimentation which seeks to stimulate learning rather than perform a strict evaluation of a concrete proposal.

The research cycle

The research strategy of this study was developed by combining experimental learning with DRM and consists of three main phases which together form a continuous learning cycle: reflection, modelling and experimentation.

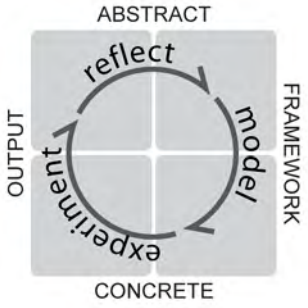

Figure 9.3: Research cycle.

_ **Reflection**
The research cycle starts with a reflection on knowledge and experience. The objective is to arrive at a tentative hypothesis which suggests how a methodological framework can improve the desired qualities of the innovation map. Herein we may, for example, consider what the underlying causes are for the unsatisfactory output and how the methodological framework can better support the exploration of the innovation space.

_ **Modelling**
On the basis of the hypothesis we can start a search for potential new theories and methods. The search provides the input for the development of an effective new approach which may subsequently be integrated into the basic process and become a consistent, coherent and practical working prototype of a framework.

_ **Experiment**
The prototype is tested in an experiment set up to reflect real-like circumstances. The actual experiences and results during the experiment form the empirical foundation for the subsequent phase of reflection.

Continuous learning
The first research cycle starts with a reflection on the current knowledge which initially comes from literature studies and interviews. Herein, it is assumed that the output of vision projects are superficial and fragmented because of a reductionistic trend-based approach. However, as we accu-

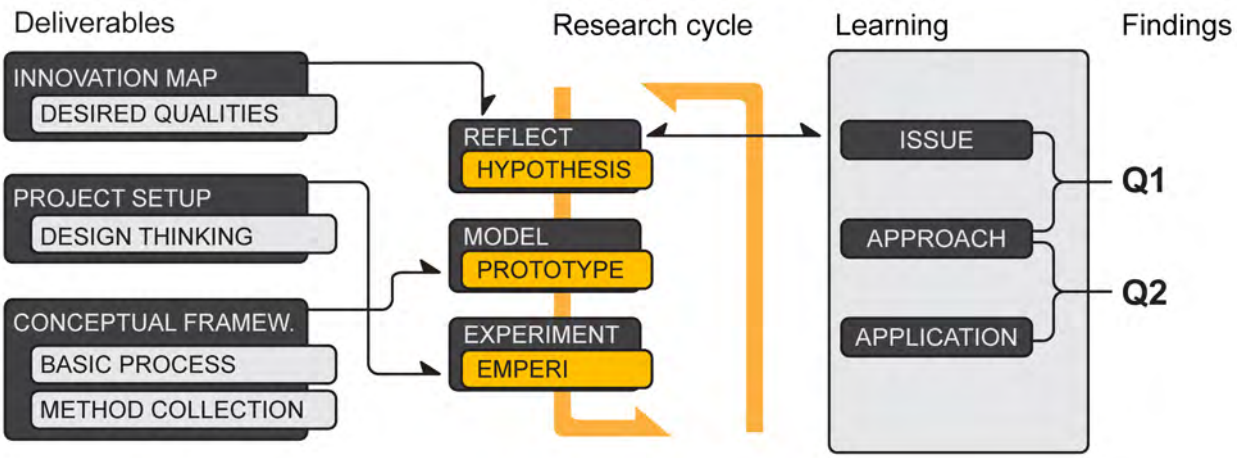

Figure 9.4: Research approach

mulate learning through the research cycles we learn more about the underlying issues and develop increasingly sophisticated hypotheses.

Within each research cycle there are three levels of learning:

- **Application:** The application of the new approach in the project context.
- **Approach:** The approach's potential to improve the navigational characteristics.
- **Issue:** The issue's ability to explain underlying phenomena that affect the navigational characteristics.

These levels of learning correspond to the inverse order of the three research questions of the study and are the foundation for making recommendations for a new methodological framework.

9.4 METHODS

The presentation of the methods used in the study is divided into three main phases. We will start with the modelling phase, because the reflection phase is more naturally explained as a follow up to the experimentation phase.

Modelling

Search

The hypothesis sets the direction for the search of theory and methodology which may potentially alleviate the issue. During the pre-study an extensive collection of methods has been gathered, so the collection now becomes the first subject for a systematic search. Promising new avenues are then further explored in academic literature, over the internet and through other forms of desk research. At the most abstract level the search is focused on identifying different ways of supporting the hypothesis. At this level we outline communities of academics and professionals which share the same assumptions concerning the hypothesis. The 'community overview' that was created in the pre-study is an important point of reference for identifying new communities. The most promising communities are subsequently subjected to intense investigation in order to find key methodological elements that are relevant and transferable for a new methodological approach. Infographics, complexity theory, knowledge management and socio-technical studies are examples of such fields of study being investigated thoroughly. A clear requirement for new conceptual perspectives is that they can be made operational or and make a difference on a methodological level.

Effective, coherent and consistent
Even though journals and libraries adhere to precise classification of knowledge much of the relevant theory and methodology is presented in very specific contexts which are only accessible by the internet. Eventually, the iterations of different search strategies yield a small selection of potential framework elements and the phase of modelling an effective, coherent and consistent approach can begin.

A particular hypothesis typically requires that several elements work together to generate the desired effect. Then each of these has to be made operational and suitable for the intended project context. Through several iterations of modelling, thought experiments and logical structuring at both a general and specific level the framework elements eventually form a coherent and consistent new methodological approach. Finally, the approach is integrated with the basic process in order to form a complete methodological framework.

Documentation
The methodological framework is documented by models and a concrete project process at different levels of resolution. At the most general level we find the basic process which was developed during the pre-study. Not all proposed methodological approaches are relevant to all the phases, but it is important to understand the particular approach position in relation to the whole process. Depending on the scope of the approach and experiment, detailed descriptions of the key phases are developed. These guidelines will be adapted to the circumstances of the experiment. For example, in experiments with many groups the guidelines are more detailed to assure that the experiment can be performed without much help of a facilitator.

Experimentation

The purpose of the experiment is primarily to learn about how a proposed methodological approach affects the outcome, but it should also investigate how that approach fits the project context and designerly practices. Herein we must investigate the socially constructed understanding of the methodology and the outcome. That requires an in-depth insight into the thinking and action of the participants, which is best achieved by a qualitative experiment with a participatory approach, allowing for an ongoing informal analysis in which the team's interpretation can be uncovered.

Inspiration is taken from participatory action research because it allows the researcher to play an active role in the experiment in contrast to other types of experiments where the researcher avoids interference. This is particularly important in order to assure that the experiment is not sidetracked because of misunderstandings or too demanding elements. Without intervention the framework has to be much more directive, without really challenging the participants' skills. A less instructive approach is also preferable as it allows the participants to apply a method creatively in the given context and thereby inspires methodological adjustments to optimize the fitness of the proposed framework. Furthermore, intervention enables the research to test sub-hypotheses which appear during the experiment, thereby speeding up the learning cycle.

> *"We suggest that action research, as a research method in the study of human methods, is the most scientifically legitimate approach available. Indeed, where a specific new methodology or an improvement to a methodology is being studied, the action research method may be the only relevant research method presently available." (Baskerville & Wood-Harper 1996, p.240)*

It is a demanding research method because the researcher is both facilitating the experiment – sometimes as a participant – while reflecting on the experiment from a researcher's point of view (Argyris et al. 1985).

Empirical material
The experiments are documented in a number of ways. The researcher keeps a daily log which records both the facilitators' thoughts and ongoing comments of the participants. In order to clearly document the process and identify issues, the process of the experiment is subdivided into several activities with milestones which produce specific visualizations of the content at a particular stage. The material is collected by the facilitator, so that the evolution of the innovation space can be traced back in time. The experiments conclude with the making of innovation maps which are then discussed and commented on by both the facilitator and participants in plenum.

Questionnaire
At the end of the experiment the participants are asked to fill in a questionnaire anonymously. The role as a facilitator is an active role in which a neutral and objective relationship cannot be maintained. In particular when the facilitator is introducing his own framework, the participants may easily feel that criticism will be taken personally and may in an academic setting affect negatively their exam marks. It is therefore important to make the participants' feedback anonymous.

The questionnaire is semi-formal and guides the participants through the major aspect of the methodology and creation of the content. It contains a mix of quantitative questions which are easy to compile into general indicators and open questions that give room for reflection and unforeseen perspectives. It complements the information gathered as a facilitator, because as a facilitator it is natural to engage in a dialogue but it is not feasible to follow more than one group at a time or to be present at all stages of the research.

Reflection

The experiments are followed by a period of reflection in which the fitness of the methodology and quality of the outcome are evaluated. The fitness of the methodology can be evaluated on the basis of the daily log and the final questionnaire. It is not unusual for innovation teams to become confused at times when performing a new type of project ,so the final questionnaire is important to reflect on the reasons for the difficulties encountered during the project process.

The evaluation of the project outcome is more cumbersome. The participants are asked to give their own judgment of the outcome, but a more in-depth analysis is necessary to estimate its 'navigational' properties. For this purpose the outcome of the experiment is manipulated and coded in different ways. Firstly, all the final innovation maps are merged into a single map. This gives an overview of the total variance and comprehensiveness across all participants in the experiment. Secondly, the material from all milestones is organised in chronological order as if it were produced by individual participants. This gives insight into the progressive evolution of the innovation space and reveals some of the reasons for the variations found across all participants in the final innovation map. Finally, the reflections from the daily log and questionnaire are drawn into the analysis and provide inspiration for new interpretations of the material.

The analysis provides a deeper understanding of how a methodology framework may make the outcome of vision projects more navigational. This adds new insights to the accumulated learning about the three research questions and may inspire either an elaboration or reformulation of the hypothesis.

9.5 QUALITY

Design researcher Nigel Cross (1995) cites Bruce Archer for naming the following attributes as 'best practice' in design research:

- **Purposive** - based on identification of an issue or problem worthy and capable of investigation
- **Inquisitive** - seeking to acquire new knowledge
- **Informed** - conducted from an awareness of previous, related research
- **Methodical** - planned and carried out in an efficient and disciplined manner
- **Communicable** - generating and reporting results which are testable and accessible by others

The first question concerns the relevance of the research to practice. Verschuren (2009) asks more broadly: Are we researching the right thing? The question entails a reflection on the ethical legitimacy and acceptability of the research. In the introduction and pre-study it has been argued that the research subject is important in terms of facing modern challenges and creating value for people, business and society. A more relevant and noble endeavour is difficult to encounter! It is believed that this study also comprises the other four attributes, but while these attributes may serve as general inspiration for setting up the research, they are not specific enough to evaluate the quality of the findings. In the following we therefore present more specific ways of evaluating the research, which canbe applied within the general attributes cited by Nigel Cross.

Relevance and rigour
It has previously been established in this chapter that this study is applied research and that the overall aim is to produce knowledge which is relevant to practice and adheres to an appropriate scholarly standard. When these aspects are not appropriately balanced the modelled methodology *"... is either scientifically proven, but then too reductionistic and hence too broad or too trivial to be of much practical relevance, or relevant to practice, but then lacking sufficient rigorous justification."* (van Aken 2004, p.221).
Though the field of engineering design research uses different terms, these two aspects are very much present in their schemes for validation. By synthesizing popular references for validation of design methods, we arrive at the following four criteria (Buur 1990; Yin 1994; Pedersen et al. 2000):

- **Empirical validity** concerns a) the appropriateness of the example problems that will be used to verify the performance of the method; b) the usefulness of the outcome of the method with respect to the initial purpose for chosen example problem(s).
- **Construct validity** refers to a) the validity of the individual constructs constituting the method, herein the coherency with established theory; b) the internal consistency of the way the constructs are put together in the method.

- **Internal validity** refers to whether causal relationships may be determined between method and outcome, so that the achieved usefulness is linked to applying the method.
- **External validity** refers to whether the research findings can be generalised and the usefulness of the method beyond the chosen example problem(s).

The research methods in this study have been selected to support all of these types of validation. For example, the experiments provide evidence of the fitness of the methodology and the usefulness of the outcome. Furthermore, the example problems were chosen within the defined types of 'modern challenges', but contain also some variance within this subject, which may support the claim that the methodology is applicable to a class of problems.

With regard to the construct and internal validity, the modelling was performed with particular attention to the consistency between different framework elements and coherency within established theory. Even though new elements were combined in a pragmatic manner, they were persistently tested by logical reasoning and simulation.

However, it is difficult to arrive at conclusive evidence about all of the above mentioned criteria. Poggenpohl (2003, p.6) notes the following about modelling of methods in design research:

> *"The problem most frequently pointed out for this research model is validation of the proposed methods. The effectiveness cannot be easily measured since it requires real use of the method in practice and the evaluation involves many variables. This problem is common to all methodological research across disciplines including engineering design."*

This type of research concerns complex social processes in which many factors influence the result and *“in most cases problems are strongly embedded in and interwoven with the local, social, political and technological context.”* (Verschuren 2009, p.23). It would be comforting if it were possible to assess the quality of the outcome of vision projects produced by a certain methodological approach. However, radical innovation opportunities are hypothetical proposals which cannot be proven right or wrong.

Because it is not possible to provide final evidence of any of the above criteria, the research is ultimately validated by building confidence and gaining acceptance from peers (Pedersen et al. 2000). Buur (1990) also suggests testing whether *“models and methods derived from the theory are acceptable to experienced designers”.*

Acceptance

In this study we have sought acceptance from several parties. Firstly, there are the participants in the experiments. They are competent design master students who directly experience any inconsistency or incoherence in the framework. As designers they will also be able to indicate how well the methodology fits their ways of working and the project context. Secondly, we have sought for this study acceptance among both professional and academic peers. All key elements of the study have been presented, documented and discussed by attending numerous workshops, seminars, courses and conferences in Europe and North America. A few examples follow:

- **Fourth Nordcode seminar**, Trondheim / Norway, May 2005
  Presentation: “Foresight for Innovators”

_ **Second Int. Seville Seminar on Future-Oriented Technology Analysis**, Seville / Spain, September 2006
Paper and Presentation: “Bottom-up Strategies in Consumer-led Markets“

_ **Design Match**, Randers / Denmark, September 2007
Key note presentation: “Designing Everyday Life”

_ **4S Annual Meeting**, Montreal / Canada, October 2007
Presentation: “Knowing the Future: STS and Business Foresight”

_ **World Design Congress / Connecting’07**, San Francisco / USA, October 2007
Conference paper and presentation: “Future Practice: Co-shaping Everyday Life”.

_ **ECCIX**, Copenhagen / Denmark, October 2007
Conference paper: “Future Mapping”.

_ **SIDeR 2008**, Sønderborg / Denmark, March 2008
Conference paper: “Practice theory as a tool for innovation”

Even though 'acceptance' is widely recommended as the most viable way to assess the quality of research, Buur (1990) also notes that acceptance depends on the persons' own pre-knowledge and experience, the complexity of the information and the pedagogic presentation. It may favour studies that confirm the conventional wisdom and reject new knowledge.

Reflexivity
In all cases it may be difficult to accumulate evidence and gain acceptance of the findings by only looking at the prototypes of the framework. The reason is that the findings are based on insights from the analysis and interpretation of experiments, which do not easily transpire in a concrete framework. It is therefore important to present the research in a way that makes it possible to follow the argumentation of the researcher and allow the readers to draw their own conclusions (Gummesson 1991). That is even more important if the research intervenes in the experiment, as is the case in action research. When we focus on the knowledge-creating process we can regard the researcher as a research instrument, which is both empowered and biased by pre-understanding. It is therefore important that the researcher takes a reflexive attitude.

> *"A researcher’s background and position will affect what they choose to investigate, the angle of investigation, the methods judged most adequate for this purpose, the findings considered most appropriate, and the framing and communication of conclusions." (Malterud 2001, p.483).*

In this study, the pre-understanding of the researcher has been an important guideline throughout. First of all it has given an understanding of an emerging field which motivated the research project. Without an intuitive understanding of vision projects and their potential in an organisation it would have been difficult to conceptualize the phenomenon in first place. Secondly, the researcher's degree from a technical university and education in modelling methods may have created a bias towards giving the methodological framework a more decisive role in the group process than it deserves. However, the researcher's professional experience has given insight into more intuitive ways of working and helped to loosen up the format, so that designers may adapt it to concrete contexts and their own liking. Professional experience has also been instrumental in understanding cognitive processes and movements around the innovation space. These

insights have been decisive in the continuous development of new perspectives on the key issue and to a large extent have shaped the study.

Multi-faceted evaluation

In conclusion, it is widely recognized that applied research is difficult to assess. That is no less true when the objective is to model a methodological framework that is a significant improvement upon some desirable characteristics that are difficult to measure. We must therefore apply several perspectives to build evidence that the findings are well-founded and contribute to both practice and academia. This thesis seeks to support several perspectives, through detailed descriptions of the methodological approaches and the outcomes, as well as to inform about the researcher's pre-understanding and ongoing reflection.

Research material

The quality of the findings produced by the research approach choosen for this study is highly dependent on the participants and facilitators ability to analyse and interpret the events that unfold during an experiment. We will therefore in the following comment on the qualifications of the students that participated and researcher.

Students qualifications
The experiments in this study were executed with master's students in an academic setting. Although the experiments had to comply with the requirements of conducting a workshop as part of the educational program, in practice it proved to be a setting full of opportunity for experimentation. In particular the students' openness to new methods and their ability to creatively and pragmatically adapt methods to a given context was highly useful and inspiring for the further modelling of the methods. Furthermore, the students were equipped with several years of the most up-to-date knowledge from the education that they were undertaking.

The experiments took place at two different universities which provided very different circumstances for the experiments. The first and third experiment took place at the Industrial Design Engineering Faculty (IDE) at the Technical University of Delft (TU Delft). The educational program at IDE is project-based from the outset, and the students have an outstanding capability to throw themselves at new types of assignments, bring in sophisticated ideas and values and deliver a concrete solution in a minimum amount of time. The projects are team-based and use visualization extensively to develop and share information among team members as well as to present ideas to stakeholders, which often include private or public organizations.

At TU Delft the course set-up involved more than 100 students. With only three sessions and one additional teacher dedicated to the exercise, it was not possible for the researchers to be actively part of all the groups. The experiments were planned so that students would be able to do the exercises on their own, and only would need to contact the teacher or researcher in case of problems.

The second and fourth experiment took place in the context of the educational program “Design and Innovation” at the Technical University of Denmark (DTU). This relatively recent educational program brings together diverse competencies from sociology, product design and more traditional engineering areas. Compared to more traditional design engineering schools, this line of study takes a critical view of the design of products, such that students learn to thoroughly investigate the role of products in

relation to people and society. Only a few universities world-wide are teaching design engineers to such analytical depth.

The experiments at DTU consisted of five to six students who formed one single design group. Obviously, this set-up made it possible for the researcher to take on a much more active role during the execution and engage in a dialogue with the design group during the experiments.

The different skills and settings at the two universities were very important to the research as they defined two extreme project contexts that could illuminate very different types of novel methodological approaches.

Researchers qualifications
The research approach requires the researcher to be skilled in a number of ways. Most critically the researcher must be able to:

_ Search and compile theoretical and methodological knowledge

_ Construct novel methods

_ Facilitate workshops

_ Interpret group processes

_ Analyse the innovation space from different perspectives

The researcher of this study has broad experience which supports these requirements. He has an M.Sc. in Mechanical Engineering from the DTU and spent a semester studying and modelling design methodology at the TU Delft. For nine years he has worked as a professional designer, innovator, vision builder and project leader in creative industries. The experience has given him an intuitive understanding of the organisational and project context, as well as a practical insight into the use of methods in innovative projects.

As mentioned before the modelling of a methodology in many ways resembles an ordinary design process. Given that the researcher is an experienced designer, it can be assumed that he has the information-processing and conceptual skills required for the research approach.

10 RESEARCH CYCLE 1

The starting point of the first research cycle is the assumption that the popular trend-based approach is overly-reductionist and does not focus on the most relevant factors for everyday-oriented innovation.

1. **Too much reductionism:** Extensive studies are typically performed to uncover future forces, only to end up with two drivers. Schwartz (1991), for example, says that selecting the two drivers is a very important but also difficult element of the scenario process. However, upon selection of these drivers, much of the context's richness is lost and the vision space is restricted to a very narrow area which does not do justice to the complexity of everyday reality.
2. **Irrelevant macro-level factors:** The trend-based approach has traditionally been used for political and high-level strategic decision making, so the approach assumes that macro-level factors of society are the main drivers of change. However, innovators create visions of the everyday contexts of people and products, and even though macro-level factors affect the everyday, they are not necessarily the primary factors.

These two issues seriously compromise the quality of the innovation map, because they only present a few possible scenarios and their foundations are not well-founded. The making of a more comprehensive approach must, at a minimum, show a representative excerpt of the factors which are most relevant for the everyday. These two issues lead to the hypothesis that:

> ... a more inclusive methodological approach with a focus on the everyday context can increase the comprehensiveness of the innovation map.

10.1 APPROACH

Everyday focus

In this first research cycle we propose that changes to everyday activities are first and foremost determined by the contexts in which they take place (Hekkert & van Dijk 2001; Visser et al. 2005). It implies that the core unit of analysis of vision projects should be everyday activities from the start and alternative types of analysis of society should only be included if they have significant influence on core units.

Figure 10.1: Core elements of environmental analysis.

The activity-centric perspective means that the design process is not driven by a specific type of actor, but should be understood in the context of an activity and the natural elements of the scenarios that explain the activities.

Subsequently one can identify the factors with the greatest impact on these actors and list the driving forces that directly impact them. In this way the initial environmental analysis will contain the most relevant factors and trends for understanding change and continuity in everyday activities (Figure 10.1).

Inclusive

The inclusive approach seeks to maintain diversity throughout the scenario process and focuses on the richness of the content and the web of relation-

ships (between forces, scenarios, opportunities, etc.) rather than on individual scenarios. Instead of reducing the dimensions of the scenario space to only two drivers, scenarios are developed based on clusters of forces and trends, hereafter called keychains. The keychains are composed of a collection of forces and are selected with the purpose of creating and inspiring future direction.

The outcome of the scenario process is not just the scenarios themselves but an integrated overview of the elements of the scenario learning process: forces, scenarios, innovation opportunities, etc. It means that the process not only consists of a linear development process of the various elements, but that a number of exercises continuously integrate, position, and elaborate the content into a coherent and consistent whole.

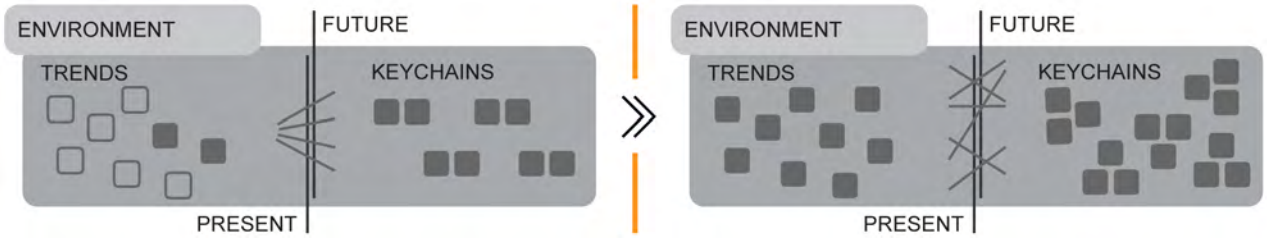

Figure 10.2: The traditional reductionistic approach (left) is substituted by an inclusive and integrated approach (right).

The power of visualization

As a consequence of the inclusive approach, the complexity of the content inevitably increases. That complexity is, to a large degree, a virtue since it is a rich source of new inspirations and insights, but it can also make the outcome incomprehensible. The inclusive approach is therefore assisted by visualization techniques that enable innovation teams to deal with a much richer scenario process and to integrate the content into a meaningful navigational innovation map.

Another argument for using visualization is that many aspects of everyday contexts cannot be easily described with text. Modern computer systems can handle very complex information, but the kind of approximate, interim, conceptual, and integrated information that the scenario process generates is not easily put into a formula. This kind of information requires a practical and flexible medium that can easily be shared by all team members, to support a learning process in which new interpretations and concepts can emerge from the material (Carney & Levin 2002).

Visualization is also essential for people to absorb, comprehend, and synthesize large amounts of information. Recent research demonstrates that visualization can enhance the human capability to deal with complex issues (Levin et al. 1987; Horn 2006; Sibbet 2006) In this way visualization is a versatile tool that can be used throughout the scenario process from the initial analysis to scenarios and opportunities. The participants in the experiment are already trained in this kind of visualization. The challenge for them is to integrate all the different kinds of content into one coherent and consistent map. So on top of their knowledge of infographics they need concrete examples and guidelines for how to represent the innovation map.

Visualization guidelines

Infographics are visual representations of information. They may consist of several graphical elements or layers that are integrated to quickly and clearly communicate a complex subject. They are commonly used to show the weather and urban transport systems. They are also used extensively

by historians, biologists, architects, statisticians, systems analysts, and others, to explain everything from microscopic systems to the big bang.

The advent of affordable information technology hardware and software has made it possible for the wider population to make infographics and has raised the general level of visual literacy. Now people expect complex matters to be easily explained, or else they lose interest. Thus, newspapers, magazines and television increasingly use infographics to support news stories. The evolution of the field is so rapid that, the last year's infographics already look outdated (Horn 2004, p.22).

The field is mainly driven by talented practitioners with educations as graphic designers or information architects. Few researchers have been scientifically studying mapmaking – cartography – because it is commonly perceived that...

> *"... a scientific approach to cartography is impractical or irrelevant, either because cartography is impractical or irrelevant, either because cartography is an art rather than a science or because the rhetorical content of maps is more important than the information they contain." (Berger 1964, p.11)*

The little research that exists is either outdated or does not concern the practical considerations of integrating the outcome of a scenario process.

It was therefore necessary to gather a wide collection of infographics and to present a selection with a few basic recommendations for the students. The intention was that the students would build on their existing visualization skills and develop interesting concepts for the innovation map.

The investigation of infographics resulted a rich diversity of samples. A number of important aspects emerged during a clustering exercise which led to the elaboration of a few initial guidelines and examples for making an innovation map.

Figure 10.3: Presentation slides showing the characteristics of a future map.

- **Create overview:** An innovation map can be used over the course of an innovation project, or even provide guidance to a company for a longer period of time. Therefore an innovation map should be comprehensive and include a high level of detail while avoiding chaos.
- **Give insight:** An innovation map is self-explanatory. It can be used as a tool within an innovation effort without the tool's makers being present to explain the meaning of the items on the map.
- **Show relations:** An innovation map emphasizes the relationships between the elements: Both relationships within layers, e.g. how scenarios relate, and between layers, e.g. how ideas fit within different scenarios. A good innovation map is well-integrated: elements generated within one scenario track are related to other forces and scenarios. A new constellation is formed that provides insight into the interplay between forces, scenarios, opportunities and threats, ideas, etc.

10.2 SETUP

Workload:
6 days work over 3 weeks

Place:
Technical University of Delft

Participants:
110 industrial design master students.

Facilitators:
Remko van der Lugt & Max Munnecke

The objective of the experiment was to test the inclusive scenario process in a real-like setting and investigate how an innovation team – in this case design students – could use visualization to create a comprehensive, transparent and fluid innovation map. In this particular experiment the assignment was framed as an exploration of the future, so the term 'future map' was used throughout the experiment instead of 'innovation map'.

Approximately 110 engineering design master students participated. The students were taking part in the 'Context & Conceptualization' course at the faculty of Industrial Design Engineering at TU Delft. The course teaches advanced design methodologies and techniques. At the time of the course the majority of students already had several years of experience in visual representation, concept generation and management of a product development process.

Textbox 10.1: Definition of future map

A future map depicts a space of alternative visions. It contains interwoven layers of information, including forces that shape the future, scenarios, future business opportunities, etc. A future map provides a company with guideposts that can assist them in navigating the future.

Brief
The assignment was defined as an exploration of possible innovations for the future workspace in the year 2020. The theme 'Workspace 2020' was taken from the overall research interests of the Studiolab and pre-determined for that year's course. It is an interesting subject because workspaces are undergoing fundamental transformation as new technologies are integrated into the workflow and change the time and place of working as well as the very nature of work. Furthermore it is a concrete context which can be studied in various ways such that a wide range of opportunities can be envisioned.

Process

The following seven-step process was constructed on the basis of the basic process (see chapter 8, “Contemporary Methodology”) and the intent to emphasize the inclusive aspects within the limits of the educational situation:

1) Frame the search
It is essential to frame the search as much as possible, while leaving enough room for exploration. The better the field is defined, the deeper the possibility of exploring a given time frame.

The future time frame needs to be considered as well. The efforts to map the future need to be placed in a long-term setting to allow for substantial and non-linear changes in the world, while still being sufficiently within reach to allow the construction of imaginable and possibly realistic future situations and pathways leading from the present to those futures. This time frame can vary a lot. For instance, in the airplane industry, product development projects take many years, which means that scenarios on the future of aviation need to have a long time frame of, say, 25 or more years ahead. The telecommunications market, however, is moving very rapidly, which already makes it challenging to make predictions of just three to five years ahead.

2) Observe with various perspectives
By exploring past and current situations, as well as trend information and existing future visions, elements that will determine possible futures can be uncovered. Here it is useful to take various perspectives. In business studies, check-lists for macro-level forces like PESTED (politics, economics, social, technology, ecology, demographics) are often used. In order to develop a comprehensive overview in the field of product innovation, one also needs to consider meso- and micro-level perspectives, including both the individual/social world, and the product/technological world. Forces, trend breakers, wildcards and early warning signs are typically included in the process.

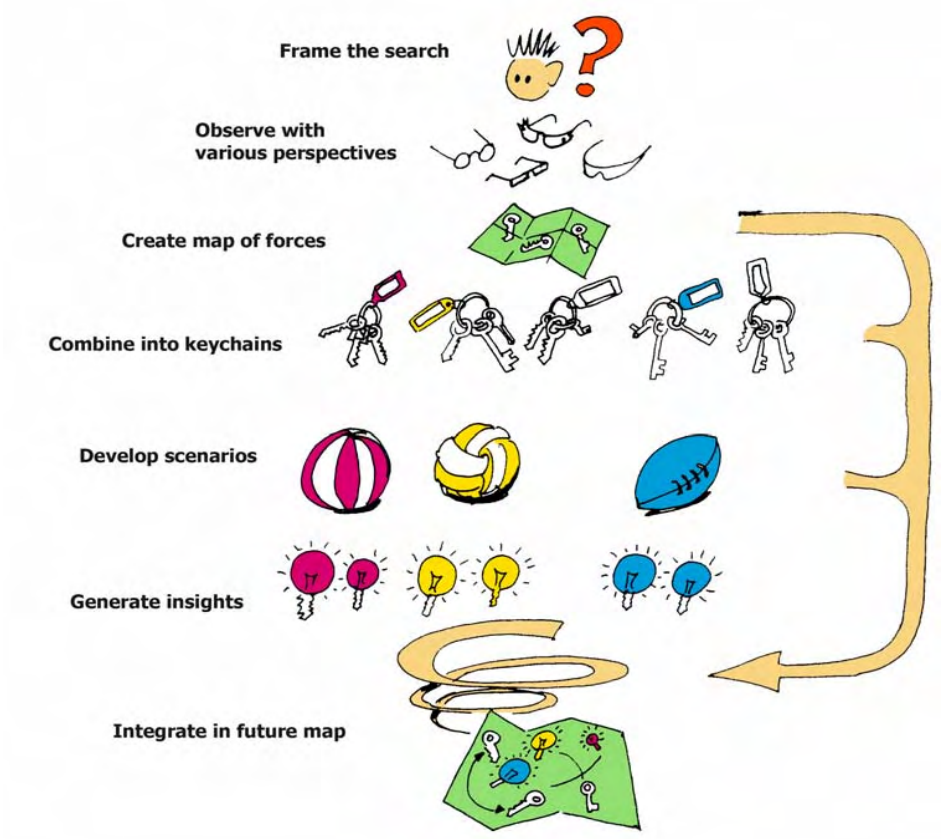

Figure 10.4: Experiment process (Artwork by Remko van der Lugt).

3) Create a map of forces
From the collection of elements, the most relevant forces – forces with high impact and uncertainty – are identified and related to each other first by means of a map of forces, which functions as the scaffolding for the future map. Concept mapping can be used to construct this map of forces (Novak & Gowin 1984). In concept mapping, graphic overviews are made by identifying, naming and drawing relationships between concepts. Trend breakers, wildcards and early warning signs can be included in such a map of forces as well.

4) Combine into key chains
We refer to future elements – such as forces (with a direction towards one extremity) and trend breakers – as 'keys'. These keys can then be combined into 'keychains', which are collections of forces that appear to fit together, suggesting an imaginable scenario. It is especially important to include forces that have a high impact on the future situation and for which it is uncertain which direction the force will take. Wildcards can be added to make the keychains more interesting and distinctive. Keychains should overlap in order to be able to relate the various scenarios to each other; the

driving forces need to be represented in more than one keychain. Identity can be given to the keychains by providing them with names or ‘hangers’.

5) Develop scenarios
A selection of the most contrasting, meaningful, imaginative, inspiring, and/or contrasting keychains is then used for developing scenarios. Scenarios provide concrete descriptions of possible contexts of future product use. In future mapping about three to five keychains are developed into scenarios. Some means for making these scenarios explicit are day-in-the-life stories, historical timelines, newspaper front pages, personas, rich pictures, etc.

6) Generate insights
The scenarios are further examined by exploring opportunities and threats for the innovation initiative at hand, and to generate product ideas that fit the scenario context. Future products will already be part of the scenario visualisations made in the previous step, so the transition to this step will be fluid. The question is posed as to what the innovation efforts could look like within each scenario. The aim is to generate opportunities/threats and product ideas that are specific to the company and/or the innovation efforts at hand.

7) Integrate in future map
Scenarios, opportunities, threats, and product ideas are then added to the map of forces. This leads to a relational diagram uncovering relationships within and between the various layers of elements. As a final step, a future map is created that can be understood and used by the innovation team. The relational diagram will surely be too complicated, fuzzy and sketchy to make any sense for people not involved in creating it. Using metaphors helps to make it possible to comprehend the complexity of the map, without losing the richness of information.

Research Planning

The experiment took place over three consecutive Monday mornings with homework assignments in between. The first and last sessions were of two hours, so only the four-hour long middle session was eligible for an in-depth workshop.

The workshop was a logical moment in the overall process for sharing the scenarios that were created in deep concentration as home assignments and in groups created a rich spectrum of innovation opportunities based on the totality of scenarios.

By the end of the workshop all group members then had the same rich foundation of scenarios and opportunities that they could integrate into a future map in another concentration-demanding home assignment. In this way, the students that had either misunderstood the first home assignment or simply were not capable of creating rich scenarios and opportunities, were still able to make future maps.

The three Monday sessions were not long enough to conduct a proper scenario process – especially without prior knowledge of the topic. The experiment was therefore kick started with a crash course in trend analysis and the presentation of pre-fabricated keychains from which to build scenarios in the first homework assignment. In relation to Figure 10.4 it implied that, after the first session, the students were ready to proceed with the 'develop scenarios' task.

SESSION 1	**Lecture (1 hour)** Introducing students to the concept of future mapping and the “Workspace 2020” theme. Presentation of scenario process, environmental analysis and keychains. **Group work (1 hour)** Discuss key forces and events that affect the theme and select keychains.
HOMEWORK A	Develop individually two scenarios based on the selected keychains.
SESSION 2	**Exercise (3 hours)** Group members share scenarios and select 3 scenarios that they want to elaborate. For each of the scenarios they brainstorm and develop new business opportunities as long as time allows. **Lecture (15 min)** Short lecture on maps of the future. The use of rich visuals was emphasised, as we believe that visual language is a powerful communication tool when complex matters are to be presented across corporate cultures.
HOMEWORK B	Finish developing new business opportunities. Integrate insights about key forces, scenarios and opportunities into a 'future map'.
SESSION 3	**Group work (1 hour)** Present future maps in groups and rate according to different criteria. Select the most “appropriate” and the most “surprising”. **Plenum (1 hour)** Discussion and evaluation of maps of the future in plenum

Table 10.1: Experiment schedule.

Preparation

In this study the Environmental Analysis was conducted by firstly identifying a number of themes that were closely related to the theme 'workspace'. These themes were: nature of work, worker, colleagues, company and society. An open search for driving forces and opposing trends that are relevant for understanding future workspaces was subsequently organized according to the themes.

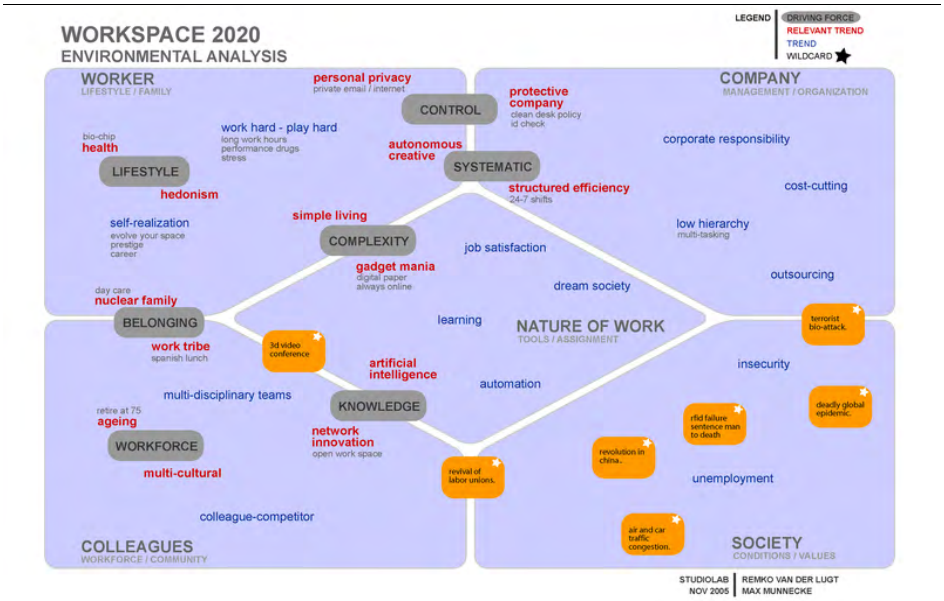

Figure 10.5: Environmental analysis. The activity is at the centre with the social actors in the periphery.

The study identified seven driving forces which normally would have been reduced to two, but in order to open up the potential scenario space the variety was maintained. Hereafter collections of trends from different driving forces were put together into what we call keychains. The collections were based upon gut feelings developed through the whole process and a sense of which constellations would make interesting scenarios.

10.3 INTERVENTION

Select keychains

The first session introduced in very broad terms the purpose of making a future map and the overall purpose of the experiment. The students had previously worked with scenarios in different forms. They were thus accustomed to developing radical new product innovation, but it was new for them to map a space of opportunities, and it was therefore important to make the point that it would be a knowledge map for organisations and not an ordinary product concept presentation.

Subsequently the “Workspace 2020” brief was introduced together with the environmental analysis that had been prepared by the tutors in advance. It is difficult to absorb a new subject in 20 minutes, so the materials were handed out and students were given one hour to discuss in groups the meaning of the environmental analysis and submerge themselves in the subject. A variety of keychains ensured that everyone could find a keychain that they found interesting, so even though the tutors only had a few minutes to talk with each group, happily, everyone finished on time.

Make scenarios

The first home assignment was to make two scenarios per student. The students were free to interpret and elaborate on the pre-fabricated keychains and they could use any format to communicate the scenario, e.g. day-in-the-life story, moodboard, persona or newspaper front page. The result was a very rich variety of storylines and formats for the scenarios, which the students used for the following exercise.

Figure 10.6: Examples of different types of scenarios.

The exercise

In the second four hour session the participants went directly into the groups they had formed previously and presented the scenarios to each other. The overall purpose of the workshop was to assure that all groups and group members had a good selection of quality scenarios and opportunities, so that they could produce a future map at home.

The first task was therefore to develop a common ground of scenarios that could support the development of a rich variety of opportunities. Not everyone had succeeded at home in making a strong scenario, and typically several scenarios overlapped, so without drama the amount of scenarios was reduced to three. Key points from each of the remaining scenarios were

Figure 10.7: The individual home assignment is presented.

Figure 10.8: Ordering the opportunities.

written on a paper to clarify for the group what the scenarios were about and to add agreed upon modifications.

Generate opportunities

Based on the common foundation of scenarios, group members now started brainstorming about new innovation opportunities that would fit the scenarios. Once the first pool of ideas was on the table the group split up into three subgroups to concentrate on the different scenarios.

After about an hour the students had three to ten quality, innovation opportunities for each scenario. The remainder of the workshop was dedicated to integrating the environmental analysis, the scenarios and the opportunities into a consistent and coherent whole that could make up the basic structure for the future map they would develop in pairs at home.

Integrate

Thus far the workshop process had followed a logical and linear process in which a particular keychain was linked to a scenario and a number of opportunities. However, the aim was to develop a comprehensive future map, so we were interested in shaking things up and seeing what kind of overview would emerge. For this purpose two different exercises were designed to develop different types of “Relational Maps”.

Relational Map: an overview of the relations between the different elements of the project outcome.

One half of the groups would perform an “ordinary” exercise in which they positioned opportunities and the forces of the keychains in relation to the three scenarios. Both elements were already linked to the scenarios, so it was merely to check for consistency and the degree to which the scenarios overlapped (Figure 10.9). The other half of the groups was asked to reorganize their content fundamentally. They were asked to leave behind the scenarios and cluster their opportunities according to a different logic that they themselves made up. Hereafter they positioned the driving forces from the keychains in relation to the clusters (Figure 10.10).

The participants were in some cases unsure about the relational map, because they were afraid to shake up things.

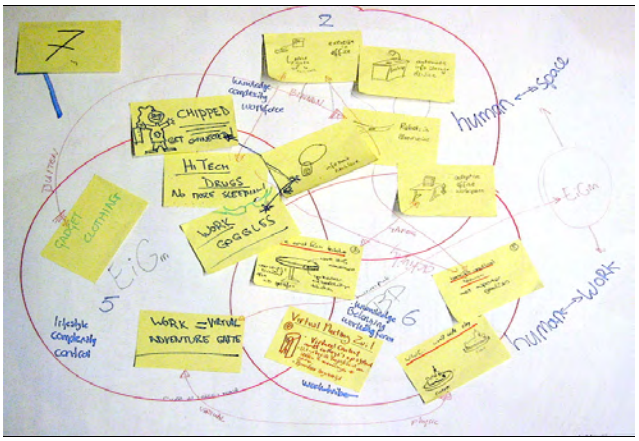

Figure 10.9: Diagram of scenarios and opportunities.

Figure 10.10: Organisation of opportunities in clusters.

Future maps

At the end of the exercise a ten minute lecture on the basic requirements of a future maps was given to prepare for the home assignment. Herein the students were advised to make sure their future map provided overview, insight, showed the relations between the content and was accessible to other people. Furthermore a few examples of maps from the preliminary

visualization scan were demonstrated to inspire the students. The main message was that there is not any formula and they were encouraged to be creative and use any kind of visual language they believed was suitable.

Final session

Exactly two weeks after the first session the experiment came to a close. Many students had spent much more time than the course demanded in transforming the Relational Maps into rich visualizations of future maps; they turned up with freshly printed A3 posters. The purpose of the last session was to evaluate their future maps.

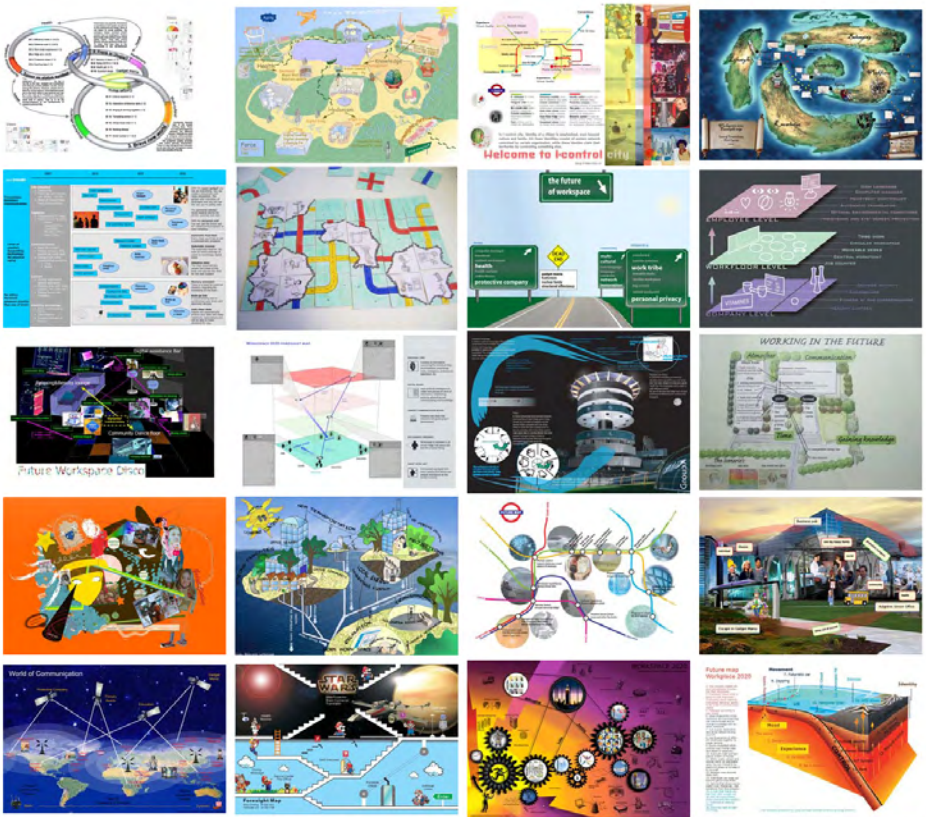

Figure 10.11: Examples of future maps. A total of 73 were received from the students.

With a total of 73 maps, which at first glance all looked different, it was not possible to go through all of them all together. Students were therefore sent straight into their groups, where they were given the task of choosing the most representative future map from the group after presenting their work to one another. Twenty minutes later all of the students came back into the auditorium and the selected future maps were presented by their creators, one after the other, while students and tutors commented. Finally, the tutors thanked the students for the creativity and energy that they had put into the experiment.

10.4 FINDINGS

Evaluation of execution

Even though the two facilitators circulated during group work, the number of students and groups made it impossible for facilitators to follow the groups closely enough to gauge how they experienced the process. The students were therefore asked twice to fill in questionnaires anonymously. The first questionnaire was handed out near the beginning of the experiment, when they first met after having created scenarios at home. At that point they had worked extensively with the keychains to create scenarios and it was there-

fore the best moment to ask them about the open scenario process and the collection of keychains. The second questionnaire was given out at the very end of the experiment and focused on the overall logic of the process and what they thought of the future map that they had handed in the same morning.

In the first questionnaire, the majority of participants were happy about the concept of keychains and stated that the keychains were inspiring, relevant and triggered their imaginations. Yet, many would have liked to have more time to submerge themselves in the subject and develop their own keychains. In the end it also came down to personal preferences, as the following two contradicting quotations illustrate:

> *”It was difficult to comprehend the key chains. They were not elaborated very much so it took a lot of time to read into the matter, which in the end is useful.”*

> *“Less information is better than too much information. It triggers your imagination much more! A few inspiring 'bites' are enough to get going.”*

Very few students found the keychains 'similar' or 'boring' or 'incomprehensible', so the keychains outlined an interesting and diverse space to investigate for the students. No one had negative comments about the number of keychains.

The second questionnaire began with their experience of the exercise. As expected the participants enjoyed generating new ideas. However, not everyone was satisfied with their quality. Some thought the ideas were too far out, while others said they were not daring enough. Many believed the ideas were 'unfinished'. A review of the material from the exercise also showed that most concepts were explained with few details. That could have been because the opportunities were never defined as a separate milestone, leading the participants to use their efforts elsewhere.

The exercise also sought to “shake up” the content of the process and make a Relational Map. More than two-thirds thought that exercise 'made sense' or 'added insight', while more than 50 percent used the relational map with little modification for the final future map. Surprisingly, less than 15 percent said they used the scenarios to organise the future map, suggesting that during the exercise and homework many participants had developed an alternative way of understanding the relations of the content. Only half of the groups in the exercise were asked to develop an alternative logic, so there must have been a considerable shift among the rest of the groups. The driving forces for the majority were the determining aspect of the future map, but a surprising 36 percent said that they used their intuition.

Finally, the participants commented on the overall process. The most common comment was that the workload exceeded expectations, but that it was, to a certain degree, self-imposed, because they found the assignment fun and interesting. It was no surprise that it could take a lot of time to develop scenarios, as well as a future map, so the facilitators had started the experiment with an environmental analysis to shorten the process. However, several participants complained that they had not made the keychains themselves, so more pre-fabricated content probably would only have alienated the participants further. Allocating more time for the experiment would have been ideal, but it was not possible, in this case, within the overall course structure.

Some participants thought the experiment process was easy to follow, while it did not make sense for others until the end:

“Eventually it made sense. The creation of the map really helped me understand how all the features were connected, e.g. driving forces, ideas, scenarios, etc.”

Not all were happy with the quality of the future maps and some would have liked to elaborate the process:

“No, I don't consider myself to have a better understanding, because we did not look at the current situation at all … Without, it is more a kind of future fantasy.”

Another participant wrote:

“The scenarios were half of the time nothing more than a collection of pictures with very small context information.”

… But what really mattered was the participants' experience of having gained insight into the future of workspaces:

“Now I have a better understanding of the future because the scenarios assignment gave me the opportunity to search for information and really reflect on workspaces.”

From the facilitators' point of view, the experiment exceed expectations. It is a very complex matter to open up the future and to challenge students with a new, open approach even though resources are limited in terms of time and facilitators. It was therefore never taken for granted that the experiment would succeed. Students seemed engaged during the whole experiment and the minor issues and comments given by the participants were within what could be expected

Overall findings

The inclusive scenario process did not pose any problem for the students and the majority claimed the process made sense.

_ **Visualization**
The students were skilled at constructing rich visualizations and used visual language freely and creatively. In their hands, visualization proved to be a powerful way to enhance capability of handling complex information.

_ **More time**
The rushed process was, to a certain degree, intentional, because the educational objective of the experiment was to introduce the students briefly to a field of research and practice that they would later have the opportunity to specialize in. However, from a researcher's point of view the students' frustrations could result in less than optimal material for analysis and a compromise in the quality of the research.

_ **Involvement in the environmental analysis**
For some students it would be more engaging to be involved from the very beginning, when the environment is analysed and keychains are constructed.

The overall success of the experiment process allowed us to proceed with a more focused analysis of the future maps.

Analysis of content

The overall aim of the experiment was to implement an inclusive scenario process and use visualization techniques to create a future map (also known as an innovation map) that was comprehensive, transparent and fluid. The evaluation shows that the implementation of the framework went

relatively smoothly, such that we can now concentrate on analysing the 73 future maps that were the final result of the experiment.

The immediate impression of the future maps was that they constitute a rich and varied spectrum of future opportunities. Most maps are unique and creative in their concept and way of using visualization. Each student had obviously put a lot of effort into forming a personal interpretation of the “Workspace 2020”– just like they had been encouraged to do by the facilitators.

The richness of the outcome shows the potential and versatility of visualization techniques and provides a foundation for discussing how the desired characteristics of an innovation map can be transformed into a visual representation.

The analysis was initially based on a linguistic analysis of the syntax, semantics and pragmatics of the visual elements in the maps (Horn 1998, p.53), but it did not capture the overall conceptual diversity of future maps. It was therefore decided to analyse the maps by clustering them according to their overall concepts. The exercise produced four clearly distinguishable categories of future maps that could be divide into more specific typologies. The main categories are:

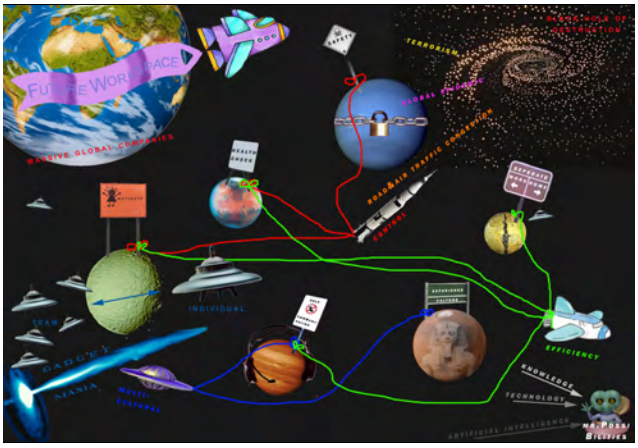

Figure 10.12: Elements flowing freely in space are connected by a single space ship.

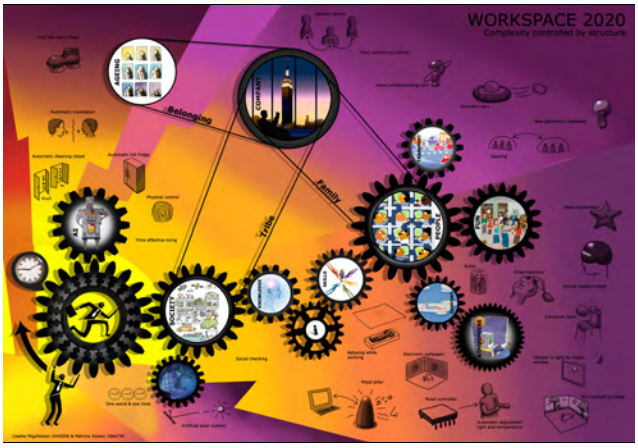

Figure 10.13: The machine metaphor emphasizes the relations in the future map.

Space

Imagine that you are zooming in from a galactic viewpoint to the room that you are in now. As you zoom in you will pass through several very distinct levels of resolution which have their own elements. The typologies use the traditional meaning of the word “map,” as a spatial orientation, i.e. space, world, continent, region, city and building. It is possible to include an almost unlimited amount of elements and relationships without having to make an explicit relation between them (Figure 10.12).

The elements of the scenario process can be organized in different ways to show various forms of relations between them. The network diagram is a relatively neutral scheme that only indicates that a relation exists but does not provide much more information, whereas evolutionary trees give direction to their relations. A machine metaphor (Figure 10.13) also emphasizes relationships. Cogwheels drive each other in different ways: size determines speed and force. Such a machine can be developed into quite a complicated system of logical relations.

Flow

Not all maps can be fully understood by following the relations. Some are based on different rules and behaviour patterns that cannot be attributed to a single element, but surround all the elements and determine what kinds of

stories may unfold. Though there are some undeniable limitations, there are plenty of degrees of freedom, such that no single story repeats. The outcome cannot be predicted, but through repeated experiences develop a level of intuition and understanding.. The game in Figure 10.14 is a straight forward example, but a metro map also has its own non-linear logic and can be experienced in multitude of ways.

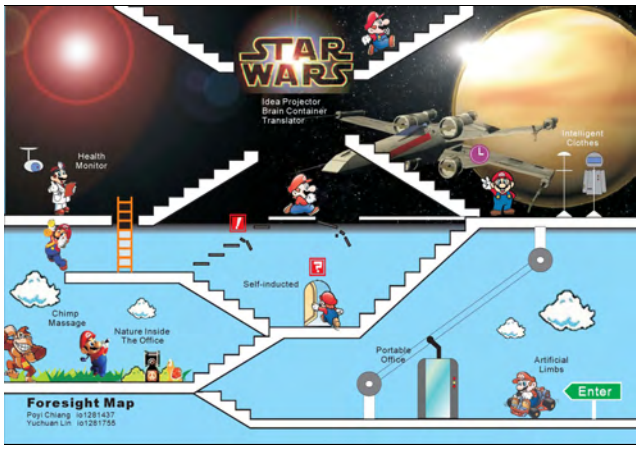

Figure 10.14: The computer game “Mario” is easily communicated and gives room for a limited number of scenarios.

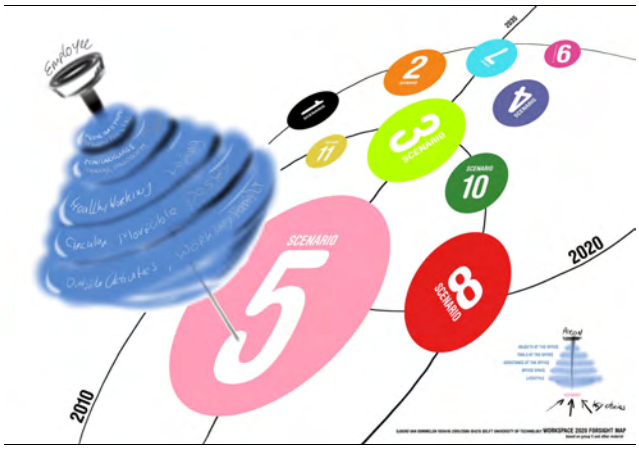

Figure 10.15: The spinning top is made up of elements which together contain inertia and influence the trajectory of reality.

Abstraction

A couple of maps do not fit into any of the above-mentioned categories. The leading part is not played by any of the elements from the scenario process. They are reduced to extras on a scene where an overarching concept, metaphor or analogy efficiently dictates the core principle of the play. Soup recipes, ecological systems or conceptual models are some examples that effectively reduce the complexity in the future map into a single principle (Figure 10.15).

There is much to be learned about each of these typologies and surely there are more typologies to be discovered, but for the overall understanding of the scenario process and future map, we will focus on the differences between the categories.

	Space
3	planetary system
3	world
9	region
4	city
12	building

	Network
3	concept matrix
6	network diagram
2	evolutionary tree
1	system

	Flow
5	metro
3	game
4	race track

	Abstraction
3	metaphor
2	concept
3	analogy

Table 10.2: Categories and typologies of future maps. The numbers indicated how many of each typology were produced by the students.

Processing information

The different typologies of maps contain different kinds of knowledge. The “Space” category merely represents data, while the “Abstraction” category contains a logic that transcends the primary elements of the scenario process. In principle the two categories contain the same primary elements, but what is shown in one as fragmented information is represented in the other as a single, underlying concept. In the field of Knowledge Management and Systems Analysis information processing is divided into distinct

stages (Ackoff 1989). Bellinger (2004) divides knowledge into the following categories:

_ **Data:** Raw data with no significance beyond its own existence. Merely symbols.

_ **Information:** Data that has been given meaning in relation to other data.

_ **Knowledge:** Appreciations of patterns in the relations between information.

_ **Wisdom:** The ability to synthesis new knowledge from previously stored knowledge by understanding underlying principles.

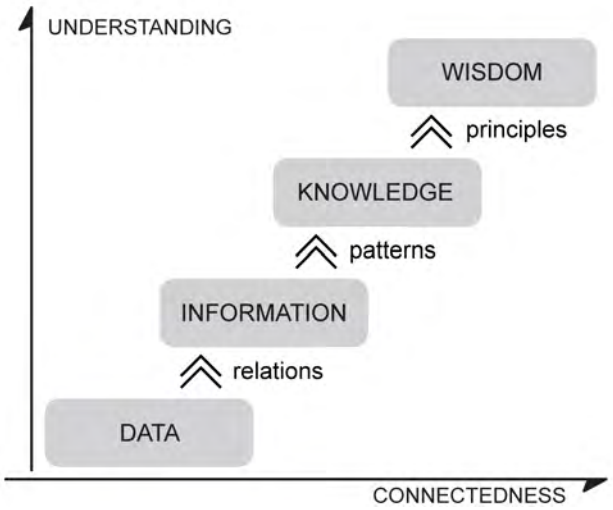

Figure 10.16: Transformation of data.*(Bellinger 2004)*

Within this framework the four categories of maps can be understood as increasing levels of knowledge processing, in which apparent chaos that comes from fragmented elements is put into order by a unifying concept (Figure 10.16).

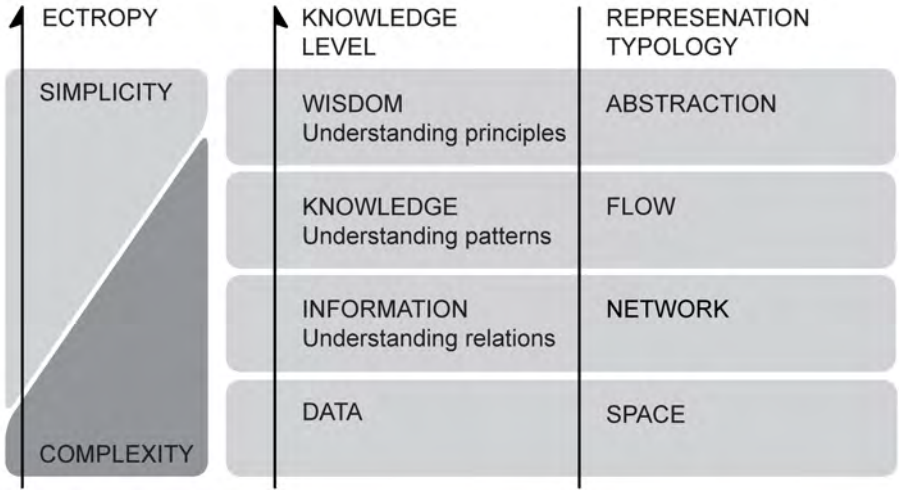

Figure 10.17: Knowledge model and representational typology.

The categories of maps mark a work process in which visualization is used progressively to increase the understanding of relations, patterns and principles that unite the elements. For each step the amount of complexity decreases, so that a more comprehensive overview can be delivered without overwhelming the viewer with information. The relations between the different elements also become more transparent; as we obtain insight into the underlying principles we can competently predict or envision the dynamics of the whole.

This implies that knowledge processing of the maps can enhance all three desirable characteristics of an innovation map: comprehensiveness, transparency and fluidity. Indeed the understanding of the nature of complexity and how to process complexity into higher forms of understanding may be the key to delivering navigational innovation maps.

Limitations to processing

Naturally, there is no guarantee that there are any relations, patterns or principles to be uncovered within a particular field of study. The ambition may be to reach the highest possible level of insight and understanding, but for each step upwards in the knowledge hierarchy alternative ways of seeing relations, patterns or principles are discarded. Careful progression is therefore needed so that significant information is not ignored in the process (Feltovich et al. 2004). Otherwise the process may become overly reductionist, which is exactly what we intended to avoid with this research.

Davenport and Prusak (1998) describe which tasks a knowledge transformation process may include. However, reaching a higher level is not only a matter of time and energy, but is also embedded in the nature of the complexity. For the same reason it is not possible to say that the best innovation map is the one at the highest level of processing. The map should first and foremost match the “true” complexity – or simplicity – of the topic at hand, so that all the categories are examples of what a final innovation map might look like. The different categories require their own specific analytical foci, which can explain why the initial visual linguistic analysis failed. The findings of the experiment therefore supports MacEachren (1964, p.12) in stating: *“My position is that there is no single correct scientific, or non-scientific, approach to how maps work.“*

In any case, visualization proved to be an efficient tool for either encompassing the complexity or quickly communicating an abstract model, metaphor or analogy by means of simple visual language.

Conclusion

The research cycle shows that the components of the methodological approach supplement each other well and significantly increase the comprehensiveness of the resulting innovation map. The new approach explores the vision space in a relevant and open manner that provides a broad overview of the future of the everyday and future innovation opportunities.

The focus on the everyday context throughout the project process was easily implemented, but there is still potential for sharpening the understanding of the elements of everyday context and investigating how to unfold the context in the most relevant directions. However, it was difficult to assess how representative each innovation map was in relation to the total potential vision space. The analysis revealed that the innovation maps had different levels of knowledge embedded in them and that the students who were able to uncover underlying dilemmas and drivers ended up with innovation maps that were easily comprehensible, yet encompassed the whole field of study.

The research therefore suggests that further improvement of the comprehensiveness requires a higher degree of transparency, based on the disclosure of the underlying structures of the innovation maps. In other words, the understanding of the nature of complexity and how to process complexity into higher forms of understandings is the key to delivering comprehensive and transparent innovation maps.

11 RESEARCH CYCLE 2

In the previous research cycle it was found that an inclusive approach can open up the vision space and make it more comprehensive. The new approach results in a more complex vision space than the traditional trend-based approach, so to avoid information overload, the designers used rich visualization to manage the information. However, rich information is not tantamount to a better understanding. Too much complexity can easily make the innovation map perplexing. It was therefore suggested that the comprehensiveness of the innovation map could be improved by processing the information and revealing the underlying structures. In other words, the improvement of comprehensiveness is rooted in an increase in transparency. The main challenge in this research cycle is therefore to create an approach which processes the content of the vision project so that complexity collapses without loss of important information.

Furthermore, we want to investigate if the ability to collapse complexity is dependent upon the particular worldview from which the everyday is viewed. Perhaps there is an inherent compatibility derived from the definition of the content, and the results can be improved by choosing particular perspectives on reality? Taken as a whole, the hypothesis of this research cycle is:

> ... new ways of defining and processing the content can collapse complexity and increase the transparency of the innovation map.

The new approach consists therefore of two interrelated components:

1. **Processing complexity**
   The content of the vision project is manipulated and integrated so that underlying structures and new conceptual understandings emerge.
2. **Defining content**
   The outcome of the processing is dependent on the type of information the content consists of. It is proposed that the content can be defined in ways that facilitate the emergence of profound insight and the collapse of complexity.

11.1 APPROACH

Processing complexity

Vision projects are different from ordinary design projects in the sense that they look further into the future and beyond the boundaries of what is usually taken for granted. The resulting vision space easily contains far more information than the human mind can grasp – even with the use of visualization.

In vision projects we can distinguish between two sources of complexity:

a) **Complexity in time**
   It is central for vision projects to envision how the everyday may evolve in the future, based on an analysis of the past and present. A large number of factors potentially contribute to the evolution of the everyday, so there may be considerable complexity in finding out how

different factors, events, elements, etc., contribute all together to a particular path for the everyday.

b) **Complexity in space**
For any given moment in time, the everyday is immensely complex in itself. A concrete everyday situation involves a full spectrum of products, people and activities. From an external point of view, the everyday forms part of a larger context of business and society. When we look ahead in time and into the whole space populated with different possibilities, the complexity is further multiplied.

The idea behind the processing of the content is that the information is somehow related, but the relations are not obvious at first glance. However, it is possible to uncover these relations, so that the information forms patterns, principles, clusters or structures, which can explain vast amounts of information. As a result, the complexity of the vision space may collapse and create an overview that is comprehensible to the human mind, without sacrificing important information.

In the following two research cycles new approaches will be developed to deal with complexity. In this research cycle, we will focus on the complexity in time that is created in the early stages of the project process.

Systems Theory and Knowledge Management
The issue of complexity digs right into a long debate about the very nature of society, nature and technology. When and where are there complexities with unifying rules – like the rule of gravity – and where do we see emerging phenomena that cannot be attributed to a particular rule, and which have to be dealt with differently? Systems Theory and Cognitive Systems Engineering have a tradition for analysing all kinds of systems. Stewart (1994, p.664) summarizes his experiences in the field by saying:

> *"... there are – and must be – rules at every level of description. To some extent we select the descriptions in which such rules arise, because our brains cannot cope with raw complexity. Every human being programs its brain, and its sense organs, to extract meaning (features) from its environment as it develops – especially during early childhood. Simple rules exist because simplicity emerges from complex interactions on lower levels of description. The universe is a plurality of overlapping rules."*

The challenge is therefore to define the level of description of reality relevant to this project, i.e. everyday visions, and to select descriptions that are more likely to expose a pattern of behaviour – also called simplexities (Cohen & Stewart 1994).

Processing and making sense

> *Everything should be as simple as possible, but not simpler*
> - *Albert Einstein*

The outcome will be assembled in a single actor-factor-trend map. Hopefully, the consistent and coherent socio-technical perspective has generated a more cooperative type of complexity then in the previous project, and with the use of two techniques from scenario planning the combined actor-factor-trend map will be processed to allow simplexities to emerge. Basically, the techniques are about clarifying the relations between different elements.

Influence diagram, timeline and trajectory maps
The first task is to make an influence diagram in which arrows and signs indicate relations between elements, the direction, and value of impact.

Secondly, the actor-factor-trend map and the insights from the influence diagram exercise are positioned on a timeline to reveal temporal relations. The two exercises provide different insights into the nature of the relations between actors, factors and trends, and reveal underlying patterns or structures (Figure 11.1). The processing of the information builds on the idea that the immediately visible information is driven by underlying factors and forces. The trajectory maps are the interpretation of these factors and forces, and suggest possible paths that the future may follow.

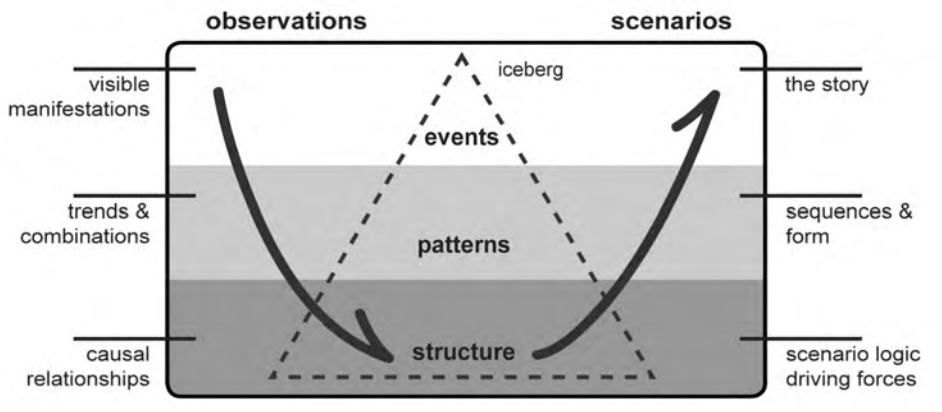

Figure 11.1: The Systems Iceberg Model. Adapted from (Senge 1990).

It is not possible to foresee to which degree a certain theme is dependent on the temporal dimension or consists of a number of possible states that are accessible across time. It is therefore important to reflect on the insights generated in the exercises and make a *trajectory map* with a format that reflects the true nature of the field of study.

Defining content

The experiment in this research cycle took place at the Technical University of Denmark (DTU) with a group of students who had been taught a number of advanced sociological perspectives on science and technology. It was therefore an opportunity to try out how such perspectives could generate a different kind of complexity – or simplexities. Herein, in particular, we drew on the students' knowledge of the socio-technical perspective in order to further specify the “everyday” focus introduced in the first research cycle.

The socio-technical perspectives are not only a wake up call for those who continue to believe in technology-determined futures, but also address the cutting edge of futures researchers who treat socio-cultural and technological trends separately. It fundamentally changes the idea about a product or person and says that you cannot understand one without the other. The socio-technical theories in effect redefine the common perception of products and users as defined entities.

> *“Users and technology are seen as two sides of the same problem – as co-constructed. The aim is to present studies of the co-construction of users and technologies that go beyond technological determinist views of technology and essentialist views of users' identities.” (Oudshoorn & Pinch 2003, p.3)*

Exactly how the team should identify and describe users and technologies as co-constructed was not pre-prescribed. During their bachelor degree studies the students had been taught to think in socio-technical terms; my role as a facilitator was not to be an expert in the field, but to encourage them to use those perspectives in the project. The instructions were therefore very general so that the students were free to perform the exercise in the way that made most sense to them.

The socio-technical perspectives enabled the students to see certain aspects of reality, but did not specify where to look in relation to the concrete assignment. The students were therefore introduced in the first session to the facilitator's concepts and process of focusing and unfolding a relevant scope for the context analysis.

Everyday focus
When given a specific topic, the participants ask questions relevant to envisioning the kinds of opportunities that might occur in the future. The questions may point in many different directions and are organized according to three levels of relevance.

Beginning with the most relevant, the three levels are:

1. The concrete products and people on the scene and their interaction.
2. The context of the interaction, e.g. the facilities of the workplace, the co-workers and organization.
3. The wider environment of mega-trends, including politics, economics, social aspects, technology, and environmental and demographic dimensions (PESTED)

On all levels an open socio-technical analysis is encouraged.

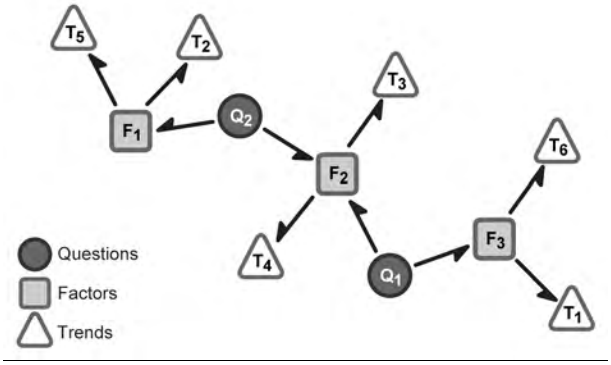

Figure 11.2: Unfolding questions, factors and trends.

With this organization of priorities an investigation of factors and trends are initiated and a complex web of questions, factors and trends are unfolded (Figure 11.2). Through this process the socio-technical approach will hopefully provide a different class of content on all levels from people and products to systems and society.

Unfolding actors-network
Realizing that users and technologies are co-constructed, it is also acknowledged that a product does not have an inherent value, but that there is an interpretive flexibility with regard to how different people give meaning to a product and how it is designed (Winner 1993, p.366). Actor network analysis aims to investigate these different interpretations by identifying 'relevant social groups' and their beliefs, practices, goals and strategies.

In the strictest interpretation of actor network theory, artefacts and systems are also considered independent actors. They do not have intentional will, as humans do, but embody inscriptions that shape people's actions. The actor-network analysis not only diversifies the meaning of people and products, but also points to states of closure and stabilization where relevant social groups have reached a consensus.

The actor network is a supplement for the analysis of factors and trends, which can reveal root causes for the change or continuity of certain factors and trends.

11.2 SETUP

Workload:
7 days work over 4 weeks

Place:
Technical University of Denmark.

Participants:
6 Design & Innovation MA students.

Facilitator:
Max Munnecke

The approach was tested in a four week 'future workshop' at the beginning of a semester-long course on “Holistic Design” for master's students in Design & Innovation at the Technical University of Denmark. A total of six students attended the course and during the experiment they altered between working individually, in pairs or as a single team. Four of the students had completed their bachelor's degrees within the same line of education and had acquired a solid basis of socio-technical education to draw from. Compared to the students at the Technical University of Delft they had received less training in conceptualization of creative ideas and visualization, but their unique combination of analytical and design skills provided an opportunity to test advanced sociological concepts in relation to the research theme.

A pre-condition for the experiment was that it must support the overall educational aims of the course. The output of the experiment would subsequently be used to select a promising innovation opportunity, to be matched with a company interested in further development of the idea. In the remaining two months of the course a particular concept would be developed into a well-rounded solution in collaboration with the company. The set-up implied that the final outcome of the future workshop should be suitable for selecting a viable concept for detailed development with regard to usability, business model and production.

Brief

The theme for the experiment was “creative work tools” for the year 2015. The assignment asked to envision the future innovative workplace and explore innovation opportunities for creative work tools. The scope of the assignment was not limited to a specific company, but took a broader, industry-level point of view that allowed for the conceptualization of radical new innovations and businesses.

The theme was selected on the basis of the wide range of social and technical issues which, within a three-to-ten year horizon, have the potential to change the nature of work. The creative work in design teams was of particular interest because it is increasingly important to the success of many companies. It is an emerging market, which will be relevant across a broad range of industries, but as of today it is primarily found within design consultancies and R&D departments of innovative companies. However, the volume of creative workers is reaching a critical mass, and their skills are becoming more sophisticated, so there is an emerging market for a new generation of creative and inspirational work tools.

The market for creative work tools has just recently emerged in the form of Method Cards (IDEO), Serious Play (LEGO), etc., but companies are under increasing pressure to innovate, so the market holds a lot of future potential.

Design consultancies have traditionally developed concrete products, but as companies realize that it is a key competence, they prefer to develop their own in-house design studios. The therefore ask consultancies to teach them how to innovate and – most importantly – provide them with creative work tools.

Framework overview

The overall process was divided into three phases: context analysis, scenario development and opportunity exploration. In this experiment there was

an emphasis on the context analysis in which a number of techniques were introduced. In consequence there was no time for integrating scenarios and opportunities, so the final outcome was an opportunity map for each scenario, instead of a fully integrated innovation map including all scenarios.

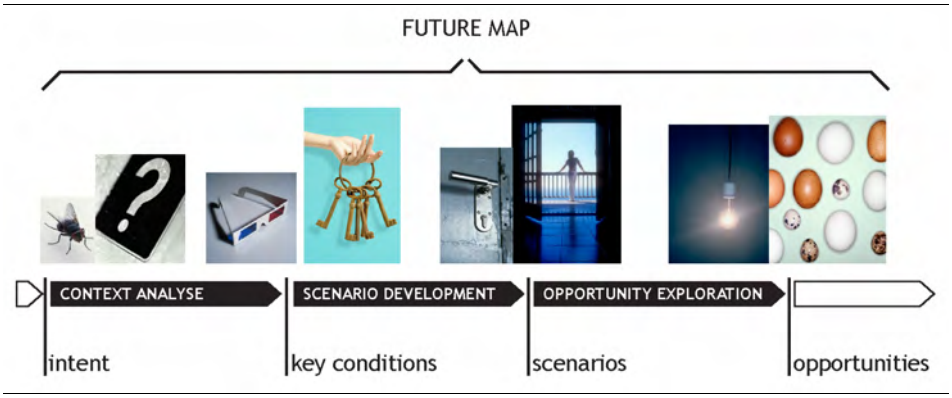

Figure 11.3: Project process.

Context analysis
The context analysis is the phase in which a certain topic and its immediate environment is thoroughly analysed in time and space. Various exercises assist the focusing and unfolding of a complex web of information. The aim is to develop a level of understanding of the topic that makes it reasonable to select a set of key conditions for envisioning future scenarios.

_ **Intent**
Which presumptions and intentions are the premise for starting the project? Discuss which trends or developments give reason to believe there is potential within this focus. List concrete contemporary examples so that everyone is on the same page.

_ **Framing questions**
What would you like to know about the future? Put yourself in the shoes of a future industrial designer or product manager and ask the questions that would help you make an artefact that fits the future context.

_ **Analyse factors**
Which factors and trends affect the questions? For each question explore the factors that relate to the questions. List as well the trends that influence the factors. Make a network of the factors and a diagram of influences that shows how trends may affect each other.

_ **Analyse actors**
Which human and non-human actors are related to the focus and factors? List the social and technological actors. The factor and trend analysis may help you identify the central actors. Include how they relate to each other and how they are interpreted.

_ **Actor-factor-trend map**
Integrate the findings up to this point in a single overview.

_ **Explore**
Search for information about the present, past and future, and enrich the analysis. You are now ready to explore the issue over various horizons. Start with the present and get a feel for the dynamics by going back in time, then make a run for the future.

_ **Crystallization**
Can a socio-technical viewpoint enlighten the analysis? Identify technological frames, lock-ins, scripts, closure, domestication, etc?

_ **Trajectory map**
Make an overview of the most important insights from the whole analysis in the form of a Trajectory Map.

_ **Key condition**s
Identify a range of future key conditions and explain the transition storylines.

Scenario development
Scenarios provide concrete descriptions of possible future worlds. Unlike traditional forecasting, scenarios present alternative images instead of extrapolating current trends from the present. These images provide guidance for organizations in a vivid, uncertain and complex situation.

_ **Develop skeletons**
Describe the fundamental mechanisms and dynamics that exist within each key condition.

_ **Make scenarios**
Flesh out the scenarios. Make them come alive by using day-in-the-life stories, historical timelines, newspaper front pages, personae, rich pictures, etc.

Opportunities exploration
Scenarios outline the context of future innovation opportunities, but they do not describe them in detail. Within each scenario there are multiple innovation opportunities. For an organization to fully understand the implications and potential benefits from a particular scenario, they need to explore innovation opportunities and create an overview of the alternatives.

_ **Framing opportunities**
What kinds of opportunities do you envision?

_ **Explore opportunities**
Brainstorm! Generate ideas for each scenario.

_ **Develop concepts**
Select the best ideas and develop them into concepts. Each concept needs to be described with relation not only to the value, but also to the technological, user and market implications.

_ **Make an opportunity map**
Integrate scenarios and opportunities into a coherent map.

Research planning

The experiment took place over a four week period at the university, with full-time workdays in the presence of the facilitator, plus three interim home assignments.

The first week was dedicated to the context analysis which aimed to explore and understand the field of study. This phase was all-important for the quality of the ensuing phases, but it was also time-consuming and difficult for the inexperienced students, because it was not only a matter of seeing how things are today, but required them to go back and forth in time to determine factors, trends and actors that shape the workplace and work tools. This kind of information is seldom readily available, so the facilitator sent selected literature to the participants two weeks in advance, so they could tune their minds to the theme and the future perspective.

The second session focused on the crucial transition from an open context analysis into a defined set of scenarios. The students shared their homework and merged it into a common foundation for the next homework assignment, so that no one would be lost and everybody could continue from the best possible starting point for making scenarios.

In the third session the purpose was once again to merge the students' homework, but this time to develop a strong foundation of scenarios and make use of the collective, creative capacity of the group to generate a large number of initial ideas about possible innovation opportunities.

These ideas were clustered around a number of scenarios which were delegated to pairs of students to elaborate at home and create an opportunity map for a specific scenario. The final session finished the experiment and led to a discussion of which opportunity areas were suitable for elaborating in the remainder of the course.

SESSION 1	09.00: Intro to future workshop 10.00: Plenum about information to collect 13:00: Collection of information 16:00: Lecture on visually present analysis
HOMEWORK A	Collection and analysis of information
SESSION 2	08.00: Presentation of visual representations of analysis from homework 09:30: Lecture on scenarios 10:00: Select scenario logic 13:00: Make scenarios
HOMEWORK B	Make trajectory maps and envision scenarios
SESSION 3	08:00: Presentation of trajectories and scenarios 09:30: Modify scenarios and select one 10:30: Brainstorm opportunities within a selected scenario 13:00: Brainstorm and conceptualization of opportunities
HOMEWORK C	Conceptualization of opportunities for a particular scenario
SESSION 4	08:00: Presentation of opportunity maps 10:00: Discussion of opportunities and overall process 11:00: Finish

Table 11.1: Experiment schedule.

11.3 INTERVENTION

Session 1
First the motivation for the theme was presented. *Creative work tools* is an unusual term – even for design students – so a number of existing work tools that support creative processes were presented: Blue Tack, Post-It notes, Velcro toolbox, method cards, pen with scanner, LEGO, rapid prototyping, etc.

A discussion among the students and facilitator arose at this point about the theme and how, literally, to understand the term *work tool*. The students preferred the term *work processes,* because they thought the assignment was too materially focused. However, the continuation of the experiment would be the development of a concrete product, so for that purpose it was reasonable to aim for something materially concrete. On the other hand, the material focus might prematurely limit the final product, so instead of *work tools* the theme was defined as *innovative workplaces***.**

Before the students started collecting information from every corner of the universe that might have an effect on the design of a future work tool, it was essential to create a common understanding of the field in order to guide their efforts and filter out the least important information. The students were therefore challenged to pretend they were talking to an oracle and to ask the questions that they needed to know to create a future creative work tool. The questions pointed to a number of factors that were more or less important to envisioning future work tools. These factors were organized on a board with the most important at the centre. The board was further elaborated to cover obvious gabs and ensure that both social and technical aspects were included at all levels.

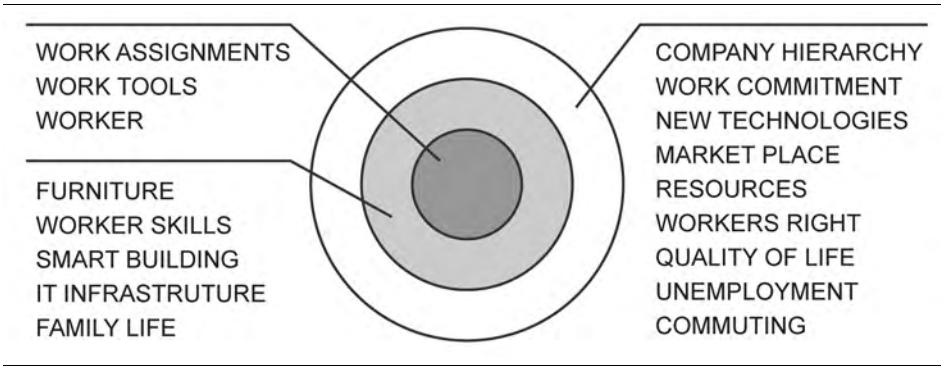

Figure 11.4: The initial division of factors.

Gradually, it became apparent that the majority of the students had not studied the brief or the literature distributed before the experiment, so the facilitator chose to move on to the next exercise, where the students would seek information and get a chance to read up on the literature.

By the end of the first session, the students created a big overall view of all the actors, factors and trends they had encountered during the day. Progress had been slow, so it was satisfying that something concrete came out of the process (Figure 11.5).

Figure 11.5: The result of the first session.

Context analysis

The final actor-factor-trend overview from the first session was only a rough outline and far from complete, so the first home assignment was to elabor-

ate, re-configure and integrate the information about actors, factors and trends.

It was an opportunity for the students to gather more information and re-focus/re-frame the context analysis according to their own convictions. The analysis was the foundation for the rest of the experiment, so it was important that it be as good as possible. There is no right way to do this, so the students were told to dig into the mass of information and manipulate it until it made sense.

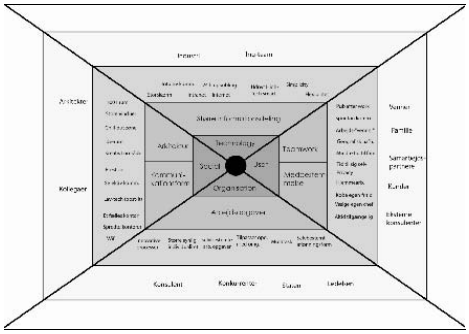

Figure 11.6: Actor-factor-trend map A

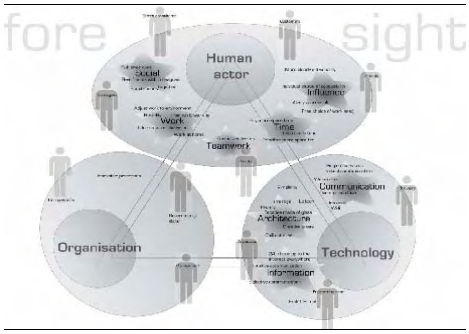

Figure 11.7: Actor-factor-trend map B

They were advised to look at the field of study from various perspectives and play around with the contents before they settled on a specific understanding of the underlying dynamics and structures. The loosely formulated assignment was intended to allow the students to take control of the process and make use of some of the analytical skills they had acquired during their previous studies. They were explicitly encouraged to use their experience with socio-technical analysis, which could be a key tool for understanding the context.

Session 2

At the beginning of the next session the participants presented their A3-sized actor-factor-trend maps. They had taken the advice to try out different types of diagrams, networks or other structures to communicate the complexity in an easily understandable way. There were examples of highly structured, network and organic schemes, but all were characterized by a low level of integration and bias towards traditional, trend-based thinking. None of the students succeeded in introducing a specific, socio-technical perspective or making the actors an integrated part of the map. The actors were merely onlookers to the factors and trends, and their beliefs, practices, goals and strategies were nowhere to be found.

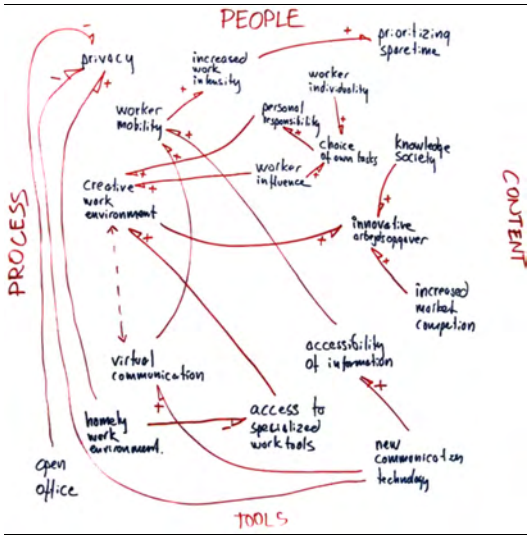

Figure 11.8: Influence diagram

The plan was to quickly move on to the development of scenarios, but due to the unsatisfactory result of the homework, it was decided to spend the morning integrating the actor-factor-trend maps and allow for quality insights to emerge. At this point the traditional scenario exercise was introduced and the students engaged in re-arranging the actor-factor-trend map according to the logic of the influence diagram and time-line.

Making the scenario logics

After lunch the group reassembled with the purpose of identifying the core foundation for the forthcoming scenarios. The team seemed slightly disoriented and reluctant to speak out. It was the facilitator's impression that the students had not developed a rich enough understanding of the theme to engage actively in a discussion and uncover underlying patterns or phenomena. To avoid a total collapse of the experiment, the facilitator made a determined effort to define scenario logics and proposed that the context analysis had three points of convergence that were characterized by the way innovation was valued. Herein, it was assumed that innovation takes different forms and is directly derived from the needs of the market. The three possible conceptions of innovation are:

_ **Innovation = facts**: Innovation is valuable when it is based on specialist knowledge. The creative work tools support experts in solving complex problems and developing new analytical approaches.

_ **Innovation = creativity**: Innovation is about creatively combining elements of existing concepts in new ways. This is a designer's paradise in which any creative combination can become a valuable innovation.

_ **Innovation = multidisciplinarity**: Innovation is about bringing people who have an in-depth, tacit understanding of the design challenges together. Only by building on their common understanding is it possible to create relevant and valuable innovations.

The three different concepts of innovation were sufficient guidance for the students to start clustering trends under the headlines and the scenario logics quickly took form. The scenario logics were constructed as keychains with a set of trends that pointed towards the overall concept, plus a wildcard which added some tension and, perhaps, a completely different dimension for the sake of inspiration.

	Scenario 1	**Scenario 2**	**Scenario 3**
Concept	Innovation = facts	Innovation = creativity	Innovation = multidisciplinarity
Keychain	Knowledge society Specialized work tools Intelligent buildings	New communication tools Individualism Worker mobility	Virtual teamwork Available 24/7 Privacy
Wildcard	Democratization of workplace	Low-tech (no tech)	Ageing population

Table 11.2: Scenario keychains.

Finally, with only two hours left of the day, the students could start creating scenarios. The plan had been to follow up on the creation of the scenario logic with a reflection on the transitions from the present to the future scenarios, but after the exhausting work with the context analysis, the trajectory maps were postponed for the homework assignment. By the end of the day

the students had divided the scenario logics up between themselves and made a brief outline to be developed into a fully-fleshed scenario at home.

Trajectories and scenarios

The home work assignment for the following week was to work in pairs and develop a trajectory map and a scenario. The students were free to choose any of the three *key conditions* identified during the last session and modify them according to their own wishes, as long as it was stated in the scenario which key condition was being used.

Trajectory maps depict possible future development paths towards a particular scenario. In other words, they outline the key conditions for a scenario. The trajectory maps can show a linear, progressive evolution in relation to the future (Figure 11.9) or different options that are not dependent on time, but exist across time (Figure 11.10).

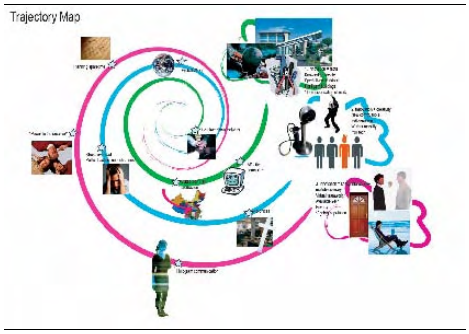

Figure 11.9: Trajectory map A

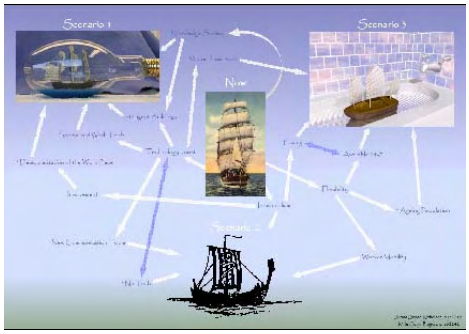

Figure 11.10: Trajectory map B

The final full-day session started with the presentation of the homework. There were examples of trajectory maps with both network and linear structure. All trajectories led towards one of the three scenario logics, so the students had obviously used it as a starting point for their maps. In principle the scenario logics should have been the outcome of the process of making the map; the decision to postpone the trajectory maps for the homework assignment therefore had a negative effect on the outcome, because they were already locked in on the final outcome of the map. Ideally, the trajectory maps would have been elaborated as an immediate continuation of the influence diagram and time-line, leading towards the definition of the scenario logics. But it had proved difficult for the students to move forward on their own at that point.

The scenarios were envisioned for 10-15 years ahead in time, and were described with day-in-the-life stories, newspaper front pages and mood-boards. It became apparent that the format of the presentation influenced the kind of information that was brought to the forefront. For example, it is natural for a newspaper to favour global and national issues. It is therefore important to select a format which naturally emphasizes the project's focus. In this project, a company newsletter – rather than a national paper – might be more effective for emphasizing local and everyday issues. Similarly, a day-in-the-life story can be re-framed as a day-at-work story.

Opportunity exploration

For the rest of the day, the students submerged themselves in the scenario worlds and explored innovation opportunities. As they were already trained in different creativity techniques, there was no need to guide them in the process of how to explore opportunities. At first the students worked in groups of two, but later they decided to form one big group. By the late afternoon they were experiencing creativity fatigue, so the facilitator had to encourage them to continue until each scenario had a minimum of three to four concepts.

At the end of the day, the students delegated the three scenarios and the corresponding opportunities into groups of two, to elaborate and finish the work for each scenario at home.

Figure 11.11: Scenario A

Figure 11.12: Scenario B

Present or future

While generating ideas, the students asked if the concepts were to be placed in the present or future. The scenarios were framed as occurring 15 or more years in the future, but the ideas they continued to work with after the experiment should be feasible within a few years. Although an important distinction may be made between the present and future, in this particular project it seemed less important. In the exercises with timelines and trajectory maps there did not seem to be a significant dependency on time. Nor did the scenarios depend on specific future technologies. In fact the scenarios could actually be realized at the time of the experiment. In this project the term *future* could, to a large degree, be substituted by *radical*, because the students were open to radical new ideas and scenarios, but they were not specifically directed towards the future. That may, in part, have been caused by the emphasis on the social, rather than the technical, side of change. The scenarios emphasized social relations and people's lives, but did not specify specific technologies. Both contemporary and future technologies to support the envisioned scenario may already exist. In order to make the transition from the future scenarios to contemporary innovation opportunities as fluent as possible, the facilitator explained that most of the concepts could be detailed in such a way as to be feasible in the near future.

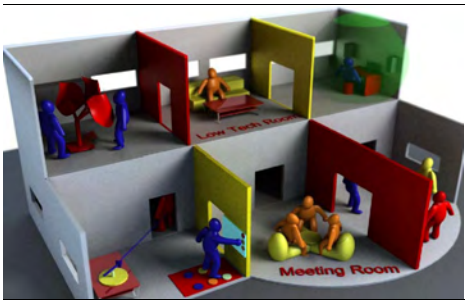

Figure 11.13: Opportunity map for scenario 2.

Figure 11.14: Opportunity map for scenario 3.

Wrap up

The short final session primarily served to make a transition from the future workshop into the concrete product development process. To start with, the opportunity map for each scenario was presented. All of the opportunities were then discussed and categorized according to market potential, user value and feasibility. The highest ranking opportunities were:

_ **Concentration box:** An electronic solution to create limited spaces with silence in open office environments.

_ **A design game:** A fun and engaging way for teams of designers to investigate the actors and their interests in a design assignment.

_ **Knowledge sharing instrument:** An intranet coupled with a huge screen.

_ **Digital clay:** A tactile medium which is directly coupled with a virtual medium.

_ **Human compass**: An easily visible compass on everybody's desktop which shows the direction to the particular person.

Epilogue

In the nine weeks following the research cycle, the group of students continued the development of a selected product concept. Immediately following the future workshop, the team decided to proceed with three ideas: creativity furniture that forces people to be creative, a method toolbox – like the Method Cards from IDEO, and an easily assembled and customized design game kit.

At the next meeting, it was argued that the design game kit had the biggest market potential, a viable business model, and a desirable value proposition for the potential users. In a final phase, the concept was developed in detail with regard to use and functional elements. By the end, the team presented a fully-developed prototype of the final product, named “Pro-Game”, which addresses a wide range of design problems, from product and workspace design, to the organization of responsibilities in a company.

Figure 11.15: The final layout of the concept for the design game.

Figure 11.16: The case with all the elements for the design game.

The product concept consists of a suitcase with a complete set of items to quickly create a design game. The elements of the game are designed to be customizable by means of enclosed cards or decks and drawings or pictures made by the participants themselves. Furthermore, the suitcase contains a digital camera and sound recorder to help players memorize the course of events and the decisions made.

11.4 FINDINGS

Evaluation

The experiment was evaluated by the students in two ways. They filled out a questionnaire at the end of the experiment, and at the end of the semester they summarized the whole project in a final report. Herein the students stated in their reflection on the process that:

> *“Our evaluation of the future workshop is in general positive, even though it was difficult in the beginning to understand the practical use of the theory. It was a difficult process for the team, because there was an iteration between opening and closing the solution space – but at the same time we experienced*

that the brainstorm as extremely inspiring, because it had such a wide scope." (Okholm et al. 2006, p.16)

The students also had a critical comment about the process, which was expressed in the evaluation scheme handed in at the end of the experiment. Unsurprisingly, the criticisms were related to the phase of context analysis in which they had experienced some difficulty. An anonymous student elaborated:

"The first three steps of the context analysis were good and made sense, but the last step did not work and lacked clarification and momentum".

Another added:

"... a bit confusing. We were shooting in all directions".

The facilitator also thought that there were problems progressing towards the identification of the key conditions for the scenarios, as he had to take on a very active role in forcing the process forward. There were several factors that might have played a role:

1. Students had not read the material that was provided before the project, so they never got to submerge themselves into the context of the field of study. The subsequent phases of processing the information of the context analysis were therefore severely derailed.
2. The different exercises that should unfold the topic were relevant and insightful in themselves, but were not easy to integrate without a master plan for doing so.
3. The use of trends and factors did not make it easy to go beyond superficial and fragmented understanding.

The result of the overall process was more important than the individual tasks, so the facilitator chose to manage the project in a controlled manner with specific, predefined timeframes for each activity. The students commented:

"The group work in the future workshop was characterized by a high degree of individual work, where individual scenarios were generated. The process and the various sub-processes were managed by the facilitator. However, the work was based on decisions agreed upon by everyone, and the emphasis on visualization meant that, at the end of the workshop, the group members had a common frame of mind in terms of an elaborated understanding of the problem and a common insight into possible future trajectories." (Okholm et al. 2006, p.32)

The impression was that the students appreciated this approach, as they otherwise would have reflected upon how and why to do a particular task, thus stopping progress. One student wrote:

"Super good idea with the practical-oriented tools that are use-oriented. We need it!"

In general, the students expressed satisfaction with the process, but would have liked more time. On the other hand, they were already pressed to do the concept development in the remainder of the project, so there was no real alternative.

"I would like to do fewer exercises and spend more time with each of them... but it was good to have done the whole process." (Anonymous student)

As the facilitator, I was happy how the project turned out in the end. Certain important points of the process had been difficult to pass, so completion of the experiment was an achievement in itself. Even though my primary concerns were with the research aspects, it was also important that the experi-

ment had an educational element and integrated well with the rest of the course. On this point the group wrote:

> *The workshop succeeded in creating a common mindset for the group with regard to the creative work and prepared us for the rest of the development work." (Okholm et al. 2006, p.16)*

The main aim of the vision process is to create a common frame of mind, so it was nice to see that the students experienced it and were able to appreciate it after they had concluded the whole project.

Analysis

The basic process model – consisting of context analysis, scenario development and opportunity exploration – structured the experiment appropriately. It served the fundamental requirements and left plenty of room for different methods and tools to be integrated.

Scenario development and opportunity exploration went according to plan, but because the emphasis was put on the context analysis, and the final outcome was not an integrated innovation map, it was not possible to make any conclusions regarding the comprehensiveness, transparency and fluidity of the innovation map.

The approach

The main purpose of the research cycle was to introduce a new way of focusing and unfolding vision projects. The outcome showed that the focus was maintained throughout the process and the students successfully bridged future scenarios with concrete innovation opportunities.

The students were expected to introduce a socio-technical perspective, but this attempt largely failed and the experiment proceeded with the use of traditional scenario concepts and techniques. Admittedly, it may have been naïve to think that the students could make sense of socio-technical terms in the context of a future workshop, and in particular when there was limited time available and just a small group of students to build the research cycle with.

Serious attention must be given beforehand to how the analytical perspectives are relevant to the vision projects and how they can be practically integrated. Such analytical perspectives are mainly constructed to understand the present and past in a scientific manner. The vision projects aim for a fluent and approximate knowledge of the probable and possible, so there is a fundamental challenge to overcome before a successful integration of a new analytical perspective is achieved. Nevertheless, it remains important to transcend conventional conceptualizations of users and products when looking for future or alternative visions and opportunities; further investigation of the myriad of sociological theories is required to identify a practical and everyday-focused theoretical foundation.

The actor-network did not achieve its full potential in the experiment and was overshadowed by fundamental problems in getting the students familiar with the theme. The transition of technological regimes is in many cases relevant for the understanding of the change of the everyday, but not all everyday topics are subordinate to a specific technology structure, so the method should be introduced with care, or it may confuse and divert attention from more central issues.

Conclusion

The research cycle revealed some practical difficulties with the new approach. The problem is that new ontological perspectives are not easily

integrated into a methodological framework. Even for a small innovation team that is trained in socio-technical thinking, it is difficult to transform new perspectives into actionable methods, techniques and tools.

However, the socio-technical everyday perspective had a clear effect on the type of information that was part of the context analysis, and many of the final concepts were based on combinations of social and technological trends.

The actor analysis, influence diagram and trajectory map were all important contributions to the processing of information and ordered the content logically. Further improvements require that the techniques for processing content are compatible with the ontological perspective, so that new insights can emerge and collapse the complexity.

An attempt was also made to identity relevant technical regimes, but because of the specific theme of the vision project it did not add new insights.

The research cycle confirmed that the key issue and the basic components of the approach are highly relevant. Further development is needed, and the research cycle has given new ideas and practical insight into how the approach may be improved.

12 RESEARCH CYCLE 3

This research cycle continues the efforts of the previous research cycle in dealing with the complexity of the content. It is assumed that the processing of the content of the vision space can uncover underlying relations and collapse the complexity of the content. As a result the transparency will increase and make way for a better understanding of the comprehensiveness of the innovation map. Similar to the previous research cycle the hypothesis is that:

> ... new ontological perspectives and information processing techniques can collapse complexity and increase the transparency of the innovation map.

The preceding research cycle investigated the complexity of time in the first phase of the project process. In this research cycle the scope is the total vision space, including all the factors, scenarios and opportunities across all phases of the project.

The new approach cultivates the content so that the similarities and differences become more apparent. Hereby, clusters may be formed around concepts and structures may emerge that help organize the content into a comprehensible overview. For this purpose a set of new techniques is introduced which are suited to integrating content from different domains. The new techniques are complemented by definitions of the content that facilitate a powerful integration.

12.1 APPROACH

Processing complexity

In traditional scenario development the content is developed in a linear approach. It implies that the environmental analysis is followed up by scenarios and opportunities without any cross checking of duplication of content or whether a representative field has been explored. Different trends may potentially lead to identical visions – just as different visions may allow for identical innovation opportunities – so the innovation map can easily become perplexing if the content is not properly integrated.

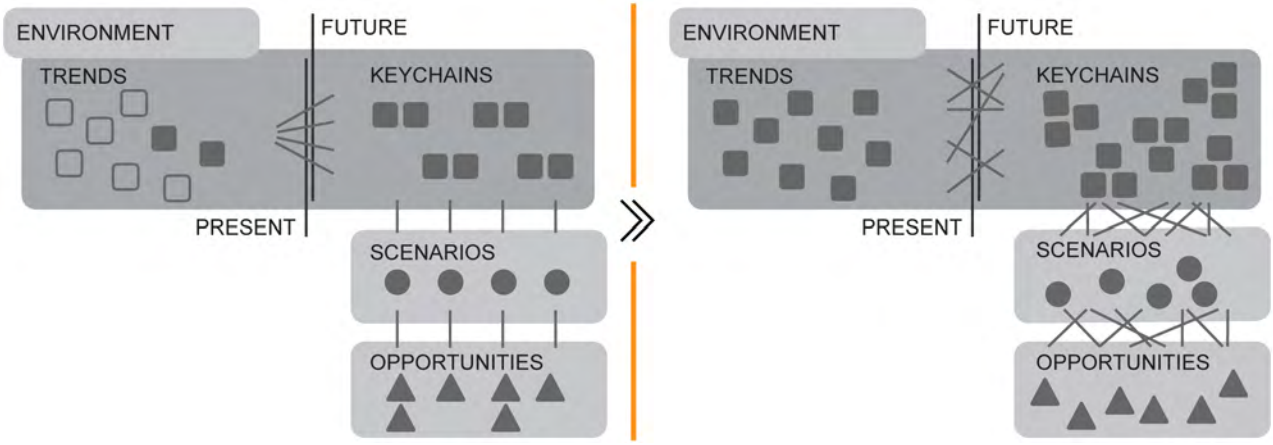

Figure 12.1: To the left: a linear approach to populating the vision space. To the right: an open approach to populating the vision space.

This integration may start from simple comparisons of the various elements and a re-evaluation of their relations (Figure 12.1). In the process of re-positioning the various elements, it reveals the degree of comprehensiveness of the exploration and highlights areas of neglect and overlapping of trends, visions and opportunities. During the processing of the content across domains, the content within a single domain is also put into perspective and the differences between elements of the same category stand out more clearly once we understand the background and effect. The approach will hereby produce a more coherent content between different domains and within a domain.

However, the re-arrangement of the content is only the first step towards increasing the transparency. The cultivation of the content can reveal new concepts or structures that collapse the complexity further.

Cultivation
The findings of research cycle 1, suggest that it is possible to uncover underlying patterns and structures of the content, but which patterns to find and how remain undefined. Traditional scenario analysts define forces, wildcards, trendbreakers, etc., as the basic elements that exist at these lower levels. These may be appropriate definitions when studying macro-level phenomena but the question is whether they also capture the essence of everyday life.

There are many different approaches to studying society and whenever it is proposed that society is constructed one way or another, there is also an implication that change and continuity take place in a specific way. Our current definition of the everyday is not rooted in a single concept and it is implicitly assumed that several aspects influence the constant negotiation of the everyday. In consequence it is not possible to decide beforehand which model is dominant. It only becomes obvious during the study of the concrete field of focus and it is therefore important to stay open to any model of explanation – including the possibility that there is no explanation to be found.

Concept maps and visual diagrams
The re-arrangement of forces, scenarios and opportunities within and across the individual domains can take many different forms. West (1991, 51) lists the following multi-purpose sorting techniques:

- Causes-effects
- Similarities and differences
- Forms and functions
- Advantages and disadvantages

The first exercise that is introduced explores the causal relations between individual elements (Figure 12.2). It is too complex to integrate all elements at once, so the forces, scenarios and opportunities are dealt with in pairs and result in three concept maps.

The second exercise organizes the concept maps into visual diagrams (Figure 12.3). The web of relations in the concept maps only concern two elements at a time. By organising the concept maps visually, it is possible for new structures and concepts to come to the foreground. The students in this experiment were trained to compare and analyse concepts at various levels of abstraction, so instead of giving them a set of criteria from the list above, they were encouraged to develop their own sense-making criteria.

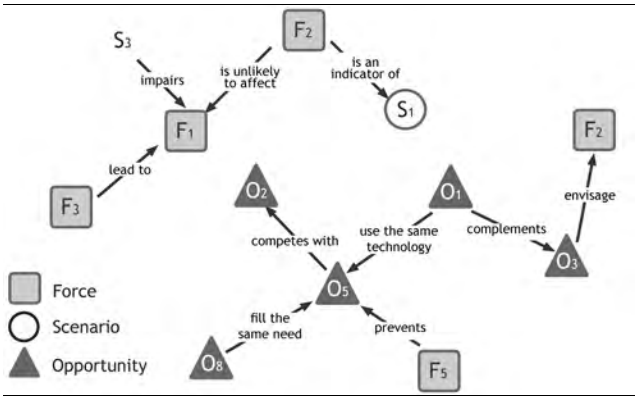

Figure 12.2: Concept map.

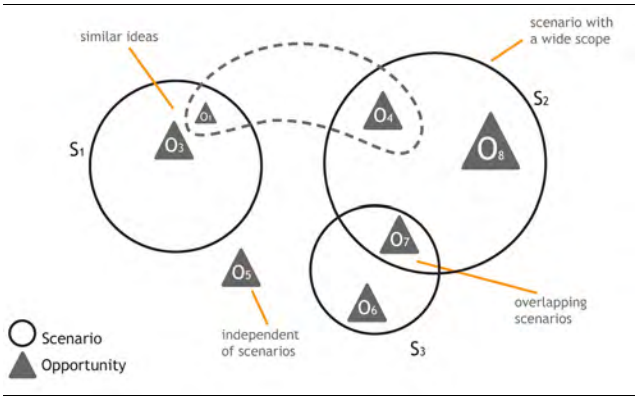

Figure 12.3: Visual diagram.

Relational map

The next exercise in the process towards the making of a future map, is to integrate all content across all domains. At this stage of the process a total of six exercises were conducted and the next task was to gather all of them into a single 'relational map' and search for patterns or principles that cut across all domains. Such profound insights do not emerge easily, so the concept map and visual diagram are essential catalysts of this process.

The relational map outlines the most fundamental structures of the content, but those structures are not easily uncovered. When looking at a single domain – or just one aspect of a domain – some particular schemes may explain the dynamics of change within that field. For example, the concept of 'regimes' helps to explain relations between different actors, and effectively collapses complexity within the field. If we consider all domains at once, the picture is much more complex and opens up for an infinite number of possible interpretations.

The models may take time and effort to explain for people who are not familiar with the science behind the models, so cognitive models that common people are familiar with may make the models operational and enable a quick and precise communication of key insights.

Cognitive models

The findings from research cycle 1 suggest that analogies and metaphors may facilitate the discovery of underlying relations, patterns, structures or

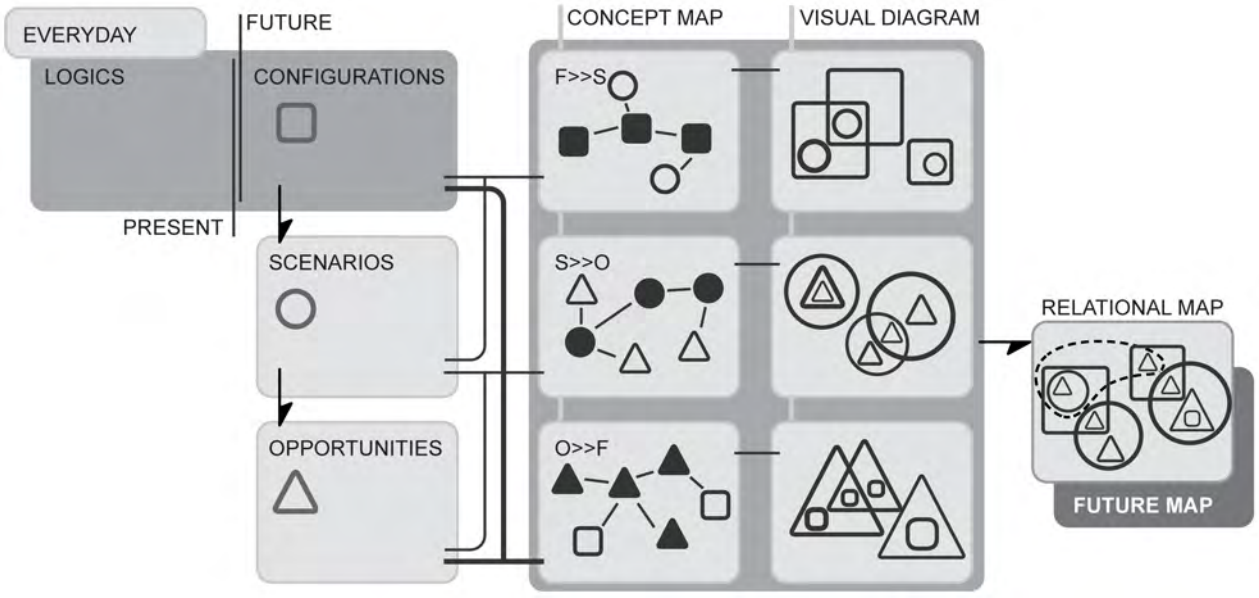

Figure 12.4: The new approach involves generation of insights at various levels, which are finally integrated into a future map.

overarching concepts that transcend the individual domains. Such schemes may potentially collapse the complexity and significantly increase the transparency of content across domains, as well as the ability to understand the source of change and continuity, so that the innovation map becomes more than a snapshot and provides a “fluid” insight into the dynamics beyond the current context.

> *“Metaphors [...] are one of the few tools to create compact descriptions of complex phenomena.” (Weick 1989, 529)*

If it is possible to identify a scheme, metaphor or analogy that can explain the essence of it all, it will greatly enhance the communication of the innovation map to external stakeholders. The danger is that the complexity may be overly reduced in the process and the resulting metaphor may freeze the content into a particular interpretation which is only explanatory for a particular time in history. The process should therefore be open to creative metaphors, butnot forcefully match the content with a metaphor.

> *“Metaphors and analogies liberate imagination, help draw attention to alternative conceptions of reality by selectively highlighting certain features of it, and thus guide action accordingly.” (Tsoukas 1993, 324)*

The cognitive models – like analogies and metaphors – take advantage of already existing knowledge and transfer the abstract rules to another domain. It is a quick and simple way of tranfering knowledge, because the models are easily remembered. However, with the infectious transmission of analogies, also comes a responsibility to choose the metaphors with care. There are important differences, for example, between social systems and natural systems (Escobar 1996).

Metaphors are important for developing a language for organizing new perspectives and conceptions around unknown phenomena. Metaphors are motivated by “image schemas which are pre-linguistic schemas concerning space, time, moving, controlling, and other core elements of embodied human experience”. (Wikipedia 2008)

Defining content

There is no guarantee that a well-organised map or profound insights will emerge from the exercises. It depends on the concrete field of study and the definition of the elements within the domains. The definition of the content continues the efforts from research cycle 2 in building an ontological foundation that is relevant for the subject of the vision project and one which may facilitate an effective collapse of complexity.

The fundamental ontological perspectives are:

1. Everyday activities are contextual.
2. Social and technical aspects co-evolve.
3. Humans and non-humans are actors.

The perspectives are derived from a constructive socio-technical world-view and are considered to be the most relevant perspective for understanding how products form part of everyday activities. This is already described in chapter 11, “Research Cycle 2”. In this research cycle another perspective is introduced:

4. The everyday is part of socio-technical regimes.

The performance of an activity requires the engagement of products and people, so in the second tier the everyday actors that take part in the activities are unfolded.

Figure 12.5: The unfolding of domains.

These actors are not independent entities, but are conditioned by the larger context of which they are a part and which is unfolded in the third tier.

Regimes

When it comes to understanding the underlying reasons for change and continuity, we will introduce the concept of “regimes”. Analytically, these concepts help us organize what usually is a complex body of factors, drivers and trends. The theory of regimes is traditionally used to analyse socio-technological systems at a large scale, but everyday activities are also an indispensable part of such regimes.

It means that everyday activities are part of a larger configuration of elements, and that the regimes can either lock-in or change everyday activities. These regimes may be broken and take new forms either if there is impact from another area of society or if a new niche reaches a critical mass and induces a regime change.

This perspective is essentially a scheme which makes it possible to link various elements, such as user practices, culture, technology and infrastructures, and consider them as one single unit. The complexity of the content is thereby greatly reduced and may be able to explain continuity and change over time, without getting lost in non-essential fluctuation.

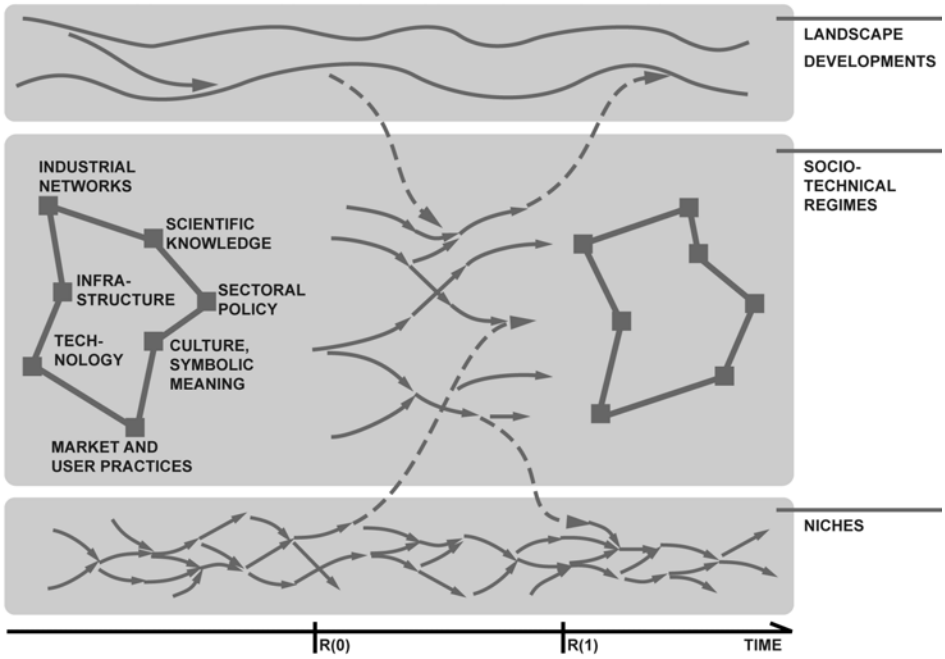

Figure 12.6: Socio-technical regimes. (Geels 2005)

Multi-perspective translation in time

The introduction of the socio-technical regime perspective breaks with previous concepts of the content, because it has its own logic. The regimes do not adhere to factors and trends, but must be analysed through actor networks and studies of alliances and power relations.

The interpretation of the different types of elements therefore cannot be executed using the same analytical frame, but must be divided into parallel streams. The reason is that when we are more specific about the nature of change, the scope of the analysis narrows down and it becomes more pressing to perform individual analysis of each of the types of content.

Each of these perspectives has its own logic about change and has to be investigated on its own premises. Once the future developments of the most relevant perspectives have been projected it is then possible to triangulate the future of everyday.

The assumption is that the everyday can be understood as a nexus of many different perspectives and that by understanding the future of each of these elements it is possible to envision the future of the everyday. Naturally, one perspective may be more important to understanding the future activities within any theme, but by exploring several perspectives in parallel such priorities can emerge in the process and need not be decided a priori. It is therefore preferable to explore several perspectives, as it is likely to generate a deeper understanding.

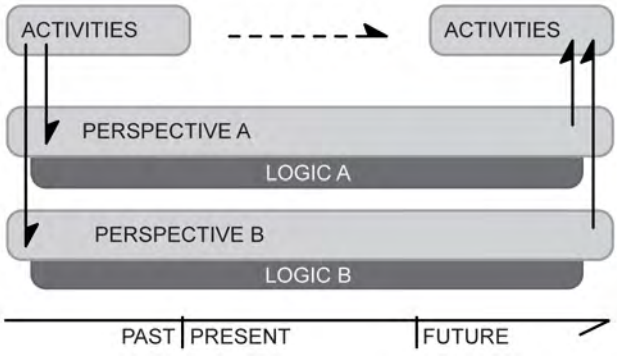

Figure 12.7: Everyday activities are shaped by different types of content that contain their own peculiar logic.

In metaphorical terms the multi-perspective approach can be understood as different spotlights which light up different sides of a subject. Only a combination of spotlights can expose the subject in a manner that a full understanding of the subject is achieved.

12.2 SETUP

Workload:
6 days work over 3 weeks

Place:
Technical University of Delft

Client:
The Dutch Ministry of Transport

Participants:
140 industrial design master students in groups of 5-7.

Facilitators:
Remko van der Lugt & Max Munnecke

Brief

This experiment was conducted at the Industrial Design Faculty at TU Delft and was set up to support a long-term research program on mobility that the faculty was undertaking in collaboration with the Dutch Ministry of Transport. The outcome was destined to be incorporated into a workshop with representatives from the Dutch Ministry of Transport as an immediate extension of the course. The motivation for the collaboration was to investigate how modern information technology and portable electronic devices might support new, attractive and meaningful activities while commuting.

On this basis, a fictive brief was formulated as though the students were professional consultants who had been given a concrete assignment by an alliance between a public transport company and a consumer electronics company. The assignment read:

1. Give a broad overview of the possible development paths that commuting may follow in the Netherlands until 2020.
2. Make a rich description of the most interesting and challenging commuting contexts that may be reality in 2020.
3. Explore the future commuting context and develop concrete/tangible products and services that may enhance the commuters' convenience, safety and experience while commuting.

The central design objective is to envision “what people may be doing while commuting” or, in other words, “everyday commuting activities”, which should be expressed through innovation opportunities that support these activities.

Process and planning

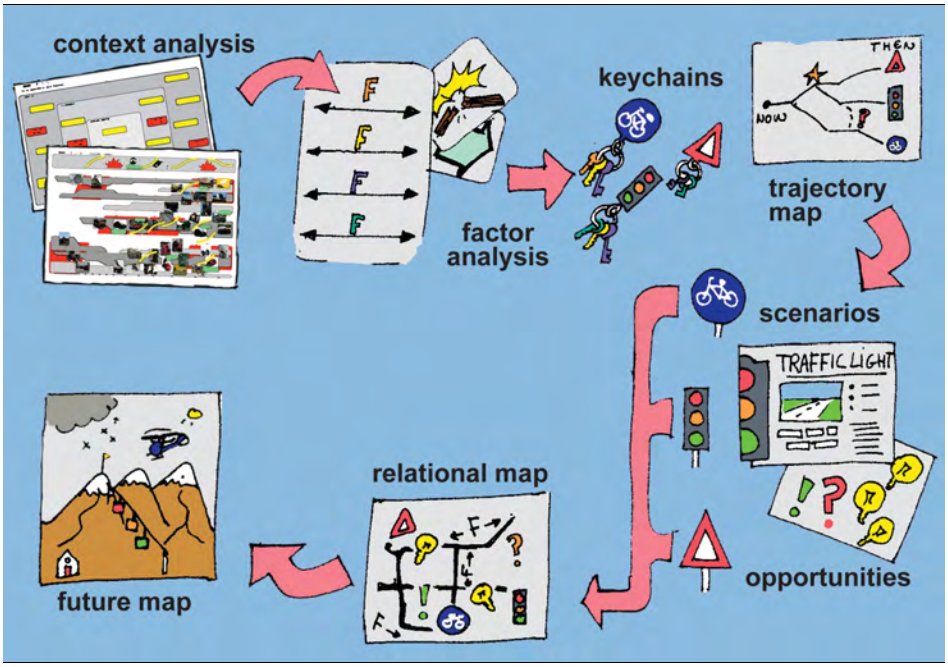

Figure 12.8: The overall project process (Artwork by Remko van der Lugt).

Course setup

This experiment was scheduled to take place as part of the Industrial Design Engineering (IDE) Master's course “Context & Conceptualization” at the Delft University of Technology (DUT) over a three week period.

Approximately 150 students enrolled for the course. The students were highly creative and trained in persistently exploring a wider space of opportunities. It was therefore a great research opportunity to perform an experiment where the participants would create a vast amount of scenarios and opportunities, that could be used as rich material for manipulation of the content.

The time allocated for this experiment was pre-determined by the course curriculum to be three consecutive Monday mornings with homework assignments in between. The first and last session had a duration of two hours, while there was a three hour slot for the middle session. The middle session was therefore the natural choice for an in-depth workshop with the students.

SESSION 1	Lecture Group work	1 hour 1 hour
HOMEWORK A	Subgroup	8 hours
SESSION 2	Group work	3 hours
HOMEWORK B	Subgroup	8 hours
SESSION 3	Group work Plenum	1 hour 1 hour

Table 12.1: Course schedule.

The limited time available for the experiment and the focus on integration across all domains made it necessary to kick-start the project, so that students would have time to generate and process the content of all the domains in the workshop. The students were therefore given a pre-fabric-

ated context analysis that would enable them to create trajectories, scenarios and opportunities after the first session.

There were only two tutors facilitating the workshop, so it was all-important to develop a workshop guide that could make the 20 groups independent of the tutors. Otherwise the workshop could easily devolve into chaos. The experiment was therefore highly structured and the students were given a workshop guide with concrete tasks to perform and specified deliverables.

Pre-fabricated context analysis

In order to give full attention to the exploration and integration of the vision space, the experiment started from a pre-fabricated context analysis based on the learnings from the preceding research cycle.

The pivotal question was “what do people do when commuting?” The question is first and foremost determined by “what do people like to do?” Do they prefer to be entertained, or are they more occupied with organizing their busy lives? What they can do is naturally dependent on which gadgets they carry with them and the services available during the commute.

Taking a step backwards, the act of commuting is part of a broader context in which people have a daily routine with various chores. Commuting is just one element in a long chain of activities by which people juggle their everyday lives. The pressures and needs of the activities that involve work and leisure affect what is done during the commute, as well as the frequency and duration of the commute. A three hour commute once a week, for example, begs other activities than a 20 minute commute every day.

The choice of a train as the means of transport also depends upon other alternatives and how people choose to mix the different options.

Focusing and unfolding the theme

The theme of the core unit of analysis is 'everyday commuting activities', which covers a vast repertoire of possible activities that may take place while commuting. The commuting situation may offer some specific opportunities and limitations but, in general, it can be assumed that everyday commuting activities are a natural part of all the activities performed throughout the day, i.e. if people are under time pressure, they may want to use their commuting time efficiently. It is therefore useful to investigate future everyday activities in general and derive from that the kind of activities suitable to a commuting situation.

Figure 12.9: Unfolding of everyday commuting activities.

The commuting situation is in itself a changing phenomenon. The means of transportation are also undergoing changes in size, facilities, speed and integration with other types of transportation. Similarly, the commuting frequency, time and distance change with structural changes in society and business. As a result the commuting situation may take many different forms in the future and have a significant impact on the kinds of everyday activities applicable.

Everyday activities involve both people and products which may take new forms in the future. In this experiment, it was especially relevant to investigate new digital technologies that could provide innovative functionalities and general changes to people's lifestyles.

All of the above mentioned factors were relevant for the assignment and could have a direct and decisive influence on future commuting activities, so the students were presented with the overview in the form of a poster. The aim was to provide them with a practical guide to gathering and exploring the information.

Furthermore, the poster was supplemented by two 'trajectory maps' that exemplify how the factors may be unfolded in time.

Translation
The unfolding is a snapshot in time of the most relevant factors. However, it should be further investigated over time. For this purpose two trajectory maps were provided for the students.

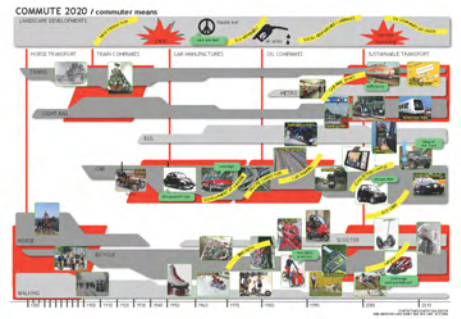

Figure 12.10: A visualization of transport technologies in the past and present.

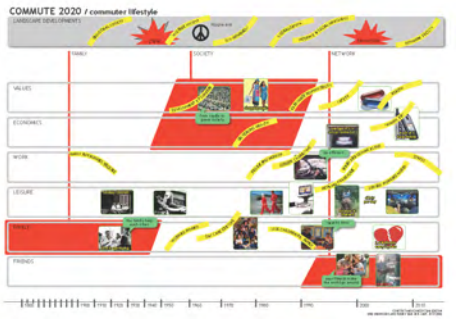

Figure 12.11: A historical visualization of people's lifestyles.

The first map described how transport systems have evolved in the past century and sought to provide background knowledge for envisioning new commuting situations described by the means of transport and their market penetration, infrastructure and services. It consisted of three layers:

1. A manifest layer with pictures of the different aspects
2. A trends layer which describes the external influences on commuting
3. A regime layer indicating the prevailing means of transport for certain eras.

The second map investigated people's lifestyles and served a dual function of informing about the social aspects of both commuting and everyday activities. The lifestyle analysis was divided into:

1. Values
   People's aspirations in the most general sense.
2. Work and leisure
   What are people's attitudes to work and leisure? Which activities do they consist of?
3. Family and friends
   How do people relate to friends and family?
4. Economics
   The economic resources that people have access to.

Similarly to the first map, it consisted of an additional layer with trends and a layer where regimes of social structures where highlighted.

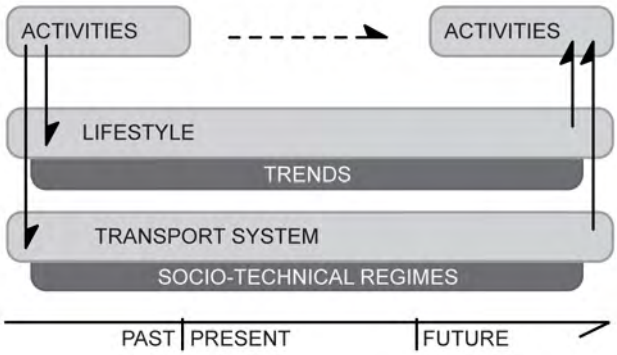

Figure 12.12: The pre-fabricated context analysis uses lifestyle trends and transport system regimes as the main vehicles of translation in time.

As the unfolding map in Figure 12.9 shows, there are more aspects that are an integrated part of everyday commuting activities and which can be investigated to achieve a more comprehensive view of the future of everyday commuting activities. Ideally, similar investigations would have covered other subjects, such as new product technologies and commuting patterns. However it was not the focus of the experiment, but served only as inspiration for the students to draw on their own knowledge and imaginations about the other aspects.

12.3 INTERVENTION

Session 1

The students had not previously been taught about scenario planning or future mapping, so the course started with an introduction to the subject and a presentation of the “Commuting 2020” brief. Then the overall project process was presented and the pre-fabricated context analysis was explained in detail.

Approximately one hour into the session the students were asked to form groups of six people and discuss drivers of changes based on the context analysis that was handed out. The goal was to create three inspiring “key-chains” by clustering the drivers of change. The different keychains were then appointed to subgroups of two people who would use them as foundations for creating trajectories, scenarios and opportunities at home.

Homework 1

At home the subgroups were given the assignment to create a trajectory map and a scenario with innovation opportunities. The first step was to draw up a trajectory map for all the keychains from session 1. The idea was that the student would be inspired by the pre-fabricated analysis and encouraged to further elaborate it for themselves.

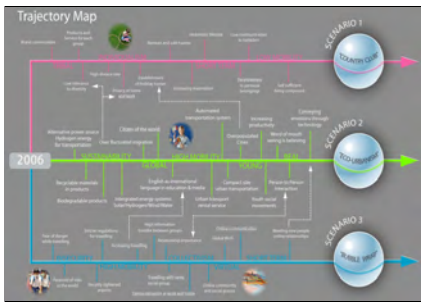

Figure 12.13: Linear-style trajectory map

Figure 12.14: Scenarios with personas.

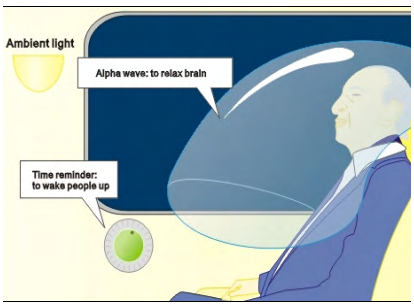

Figure 12.15: New commuting activities and innovation opportunities.

Then the subgroups created a scenario from the keychain they had been given. The scenarios could be communicated by a number of different techniques, such as newspaper front pages, day-in-the-life stories, or personas,

but again the students were free to choose whichever means they found most appropriate. Each scenario could potentially accommodate a number of innovation opportunities, and the students were asked to generate ideas for products and services to support people in their daily commute.

Session 2

The aim of the workshop was to integrate the content that the whole group had produced at home, so that the students had the best possible foundation for producing a future map at home for the final session. The workshop was planned in detail and closely followed the scheme for integrating the content as presented in Figure 12.4.

Figure 12.16: The collective homework of a group consisted of three trajectory maps and three scenarios with opportunities.

The process requires a certain amount of content before the manipulation of the content can become meaningful, so the students started the session by presenting their homework and merging all the content that had been produced by the subgroups.

The remainder of the workshop was dedicated to cultivation of the content. Firstly three concept maps were created by analysing the relations between two different sets of content at a time. Secondly, the group created a visual diagram of each concept map. The visual diagram used circles, boxes, scale, distance and other visual elements to illustrate visually the concept maps.

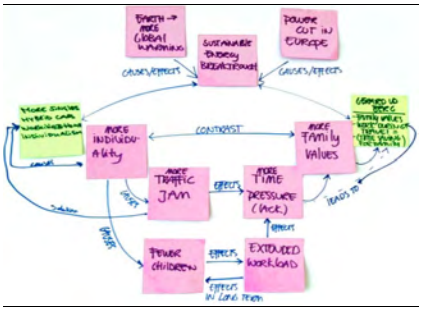

Figure 12.17: Example of "scenarios and opportunities" concept map.

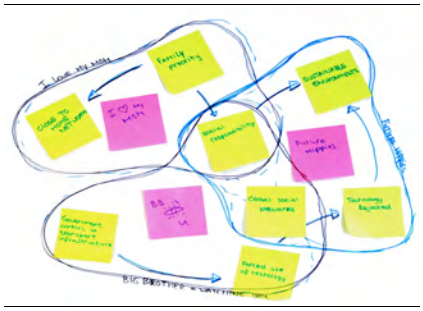

Figure 12.18: Example of visual diagram.

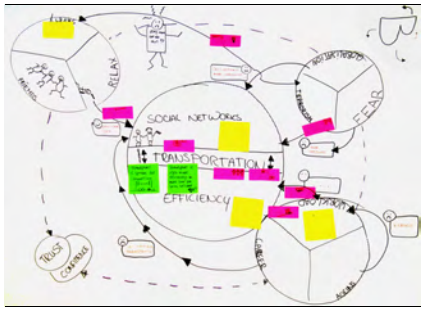

Figure 12.19: Example of relational map.

Finally, the groups attempted to identify the most important relations, patterns or issues across all concept maps and visual diagrams. Based on the most significant insights, a relational map was developed and the content was reorganized according to the insights. In preparation for the homework

assignment the groups were asked to discuss which types of metaphors matched the insights from the relational map.

Homework 2
The second homework assignment was to create a future map providing an overview, insights and clarity to the future of commuting activities and the innovation opportunities. The relational map was the immediate base for reflections on different cognitive models that could collapse the complexity. Again, students were encouraged to be creative and make their personal version of the future.

Figure 12.20: A future map with a landscape metaphor.

Session 3
In the final session the students presented their future maps to their groups and selected the future map considered to be the best example of a future map, as well as the most surprising future map. In the final plenum session the students presented their selected future maps and the tutors facilitated a discussion.

Figure 12.21: The students' selection of the best future maps.

Evaluation

Students' evaluation
A questionnaire was distributed during the last break of the last class and was returned anonymously to a box by the end of the class. The questionnaire was a mixture of multiple choice and open questions covering the dif-

ferent phases of the exercise. Questions were posed in informal language to encourage the students to freely express their thoughts.

Figure 12.22: Students presenting scenarios to one another.

Most students felt that the overall process made sense and were fairly confident that the outcome would be useful for the companies defined in the assignment. Students also expressed gratitude for learning to think about the future and gave examples of how it was useful in their personal lives.

The great majority of students complained about insufficient time. Many were simultaneously enrolled in other demanding courses, so there was not much time left for the deeper reflection needed to look into the future. The pre-fabricated context analysis on commuting means and lifestyles was welcomed and 70 percent found it to be of “medium” or higher usefulness.

The exercises in which forces, scenarios and opportunities were manipulated, received mixed reviews. A few examples:

> *“I think it's the essential part of futuremapping. I like the approaches used to analyze force, scenario and opportunity. It makes me have clearer insight of existing data.”*
>
> *“It was too much of the same.”*
>
> *“Nice putting things together, but a lot of information got lost.”*
>
> *“The group work really helps to make something of it! During the process everything became clear. The explanation of the different tasks were good.”*
>
> *“The assignment should be finished after the relational map, because from this point there is just information getting lost.”*

While they had too little time in general, it became very clear that they did not feel they lacked time for the workshop exercises,which several students described as repetitive and expressed concern that valuable information was lost in the process toward making the future map. Nevertheless, the students were generally satisfied and 80 percent rated the exercises “medium” or more useful.

Researcher's evaluation

The facilitators knew beforehand that the timetable would be tight and therefore cut the process down to very basics. It was not possible to allocate more hours to the exercise, but it was decided that it was better to do a rushed process in which the students got a feeling for the overall purpose then to spend the workshop on the specific methods that are part of the research program.

The combination of many students and little time for tutoring could have easily resulted in more frustrations, but the students' persistence and positive attitudes brought all of the groups through the difficulties. However, it also meant that the tutors were not able to guide the students in the directions most relevant for the research.

The facilitators also noted some frustration during the workshop from the students who thought they were repeating themselves. In retrospect there may indeed have been too many exercises, especially because the students had already organised forces and scenarios during the homework assignment. For some it was also difficult to see any increase in knowledge when they developed the relational map. But given the circumstances, it was what could be expected. First of all, the students were working with a limited amount of content, which did not give the feeling that complexity was a big issue; secondly, they did not have time to search for more background knowledge that could have inspired new views on the content.

Obviously, it does not pay to push for more manipulation of the content. The experiment herein exposed the limitations of such information processing techniques as well as the danger of over-reductionism when pushing too hard.

12.4 FINDINGS

The combined creativity and visual richness of the forces, scenarios and opportunities embedded in the future maps of the 110 students, made it difficult to evaluate the experiment. The first task was to get an overview of the total variation and density of the vision space the students had investigated, so the outcomes for all the students were merged and organised by scenario type.

Overview of scenarios

The scenario types fell into four main categories: transport systems, social structures, lifestyles and commuting activities. The latter is the most relevant for exploring future innovation opportunities, so it will be dealt with first.

Commuting activities
Most of the activities are not so different from what one may already experience in travelling situations today. For many people commuting adds long hours to their time away from home, so they seek to use the time efficiently by getting work-related tasks out of the way. Others use it in the opposite way: as downtime, away from demanding kids and employers – a space in time in which they can reload and unwind, in order to meet the next daily challenge with a surplus of energy. People unwind in different ways, so 'reloading' may mean cultivating inner awareness (yoga, meditation) or seeking entertainment and consumption in the form of magazines, food, music or movies. People are increasingly aware of their physical health, so they may also make use of the daily commute to prevent, diagnose or treat illnesses. The students also suggested a number of other everyday activities that can take place while commuting, such as meeting with friends, family and colleagues, dating, expanding the professional network, partying, going to a café, etc. The commute will not be a routine task for everyone, so some people will be planning the journey as they are travelling, considering alternative travel trajectories and attractive places to hop off, to the point where the commute merges with sightseeing or shopping.

Lifestyles
Many of the scenarios focused on the construction of people, i.e. lifestyles, and covered the spectrum of usual suspects from ego-centric career people to modern, new-age hippies. Few students believed (or wanted to believe) that hedonism would prevail. Instead, they predicted that people would become more aware about the environment and/or their own health. Individualism might be substituted by a communal attitude, where the family or network of friends becomes the defining unit of a person – and not only among the young and outgoing crowd, but just as much among the expanding group of retired and resourceful elders.

The typologies of lifestyles give interesting pointers to the activities that people may want to do while commuting in the future. Do they seek isolation, reflection, consumption or active interaction during the commute? What kinds of services will they need to stay in touch with friends, families and colleagues? The leads are numerous, and since all kinds of people may commute, the idea of having an adaptable space reoccurred in a number of scenarios.

Transport systems
Most of the technologically-biased scenarios envisioned a future without private cars as we see them today. The solution to contemporary and future problems seems to be that the government and companies take responsibility and organize people's commuting needs. Superbuses, free public transport, car pooling, long distance taxis, congestion charges and office trams are all examples that, in one way or another, promote communal commuting. These public means of transport can eventually contain a bike or capsule that takes you the last bit from the station.

In case you prefer the freedom offered by individual transport, you may look forward to automated scooters and cars that may even bring your kids home safely. Street lights should naturally be centrally controlled so that an optimal flow of traffic is achieved.

Bikes will continue to be popular for short distance commuting and may be further enhanced by solar energy or a modular group bike, not to mention the glass tunnels that will make it an enjoyable experience all year around.

The technological scenarios were well done, but in relation to the commuter activities they did not add any significant new circumstances for public transport. Commuting times and the mix of people remained fairly similar to what can be seen today. The value of the analysis and unfolding of commuting means is therefore limited for the overall purpose of the workshop.

Social structure
The visions of the future society can be divided into three main groups: technology- and business-optimistic scenarios, holistic-oriented scenarios with resourceful individuals, and doomsday scenarios. To some students the technology and business scenarios are similar to “Big Brother” societies in which ordinary people have no place; instead they preferred other scenarios, in which communities, responsible companies and respect for the environment are the foundation. The hope of striking a new balance which respects all parties of society and solves global problems was common and few believed in a return to traditional society. However, chances of doom are still very likely, according to some Dutch students, who particularly foresee flooding due to rising sea levels.

Defining content

Transformation and translation
The first point of analysis concerns the type of content of the scenarios. The intention was to stay focused throughout the project on everyday commuting activities and only venture into the wider context when needed. However, many students used macro-trends to initiate the trajectories, which led to scenarios about general society.

It is a long way from scenarios about general society to envisioning concrete innovation opportunities enabling specific commuting activities. You may argue that in some cases society lays a foundation for specific lifestyles and thereby indirectly influences people's needs and desires, but the future maps substantiated that these types of scenarios do not present concrete innovation opportunities.

A more relevant scenario could be achieved by breaking down such extreme events into the concrete dilemmas that they induce, e.g. a global pandemic will lead to concerns about hygiene so that commuters will avoid close contact with others or demand facilities for disinfection. In this way the dilemma not only is relevant in the extreme case of a pandemic, but can be relevant if a broad range of health issues arise.

About half of the students constructed scenarios that evolved around the immediate context of commuting, e.g. transport infrastructure and people's lifestyles. These students were subsequently able to envision a number of future commuting activities and corresponding innovation opportunities.

The results substantiated the initial claim of the research, which says that the macro-trend approach is not suitable for designers, but also led to some reflections on why the students ended up taking a macro-trend approach, when it was against the intentions of the researcher.

In hindsight, the instructions for the students were perhaps inadequate. The intentions were described, but the researcher did not elaborate on how to understand the dynamics of everyday activities – partly because, at that point, they were unknown and partly because there was not time for a thorough introduction – it was therefore left up to the students to connect the dots. The pre-fabricated analysis was intended to provide them with some contextual information, so that they could spend their efforts on working with the activities and opportunities. However, the students grabbed the pre-fabricated context analysis and built directly upon it instead of using it as inspiration for an activity-focused exploration.

The problem is that people intuitively think everyday activities are shaped by the larger context, resulting in the creation of general and stereotypical visions that are not significant for the exploration of opportunities.

The top-down approach has consequences for the composition of the content. It implies that top-levels define the parameters on the lower levels, which are not explored on their own terms. When unfolding a creative space it is, of course, the core unit of analysis that should be the subject of the main efforts and take up most of the creative space. The context should only be investigated to the point that it has a significant impact on the core unit. In other terms, the core unit should be explored to the extent of the possible, while only the probable context is investigated.

It is therefore not surprising that a majority of students had few and often vaguely developed ideas about the future innovation opportunities. They had spent their creative efforts on the context and confined the exploration to arbitrary scenarios that were remotely relevant for understanding the concrete activities and opportunities.

The facilitators were unable to change the course of direction because there were many students and minimal time for facilitation of the groups in the first session and the students had developed the content as homework for the following session.

To overcome this problem in the future, it is necessary to emphasize that everyday activities are the core unit of analysis. Unfortunately, we lack a coherent explanation of the internal dynamics of everyday activities, so that the translation in time can have its starting point in the activities rather than relying on other domains.

Socio-technical perspectives

The pre-fabricated analysis suggested a balanced unfolding of the socio-technical context of commuting activities, but the students chose to focus on one or the other. They either elaborated on technological aspects such as infrastructure, means of transportation, and everyday technology, or on social aspects such as social structures, lifestyles, needs and preferences.

The division of the pre-fabricated analysis may have led the students to believe that the two aspects should be kept separate., In any case the students probably found that there was too little time to elaborate both aspects.

Fortunately, the inadequacies of the individual scenarios were easily remedied. The project had been organized to generate a surplus of content, so in the workshop, students select the best three scenarios and further developed them with the content of the discarded scenarios. In this way, a critical mass of commuting activities and opportunities, as well as socio-technical perspectives, was achieved for all groups, so that the process of integrating the content across all domains could be carried through.

Regimes
Even though the majority of trajectory maps were a step behind traditional mega-trends, and the regime perspective was rarely applied explicitly, the exercise showed that the trend-approach and regime perspective compliment one another. They are in fact two sides of the same coin when it comes to understanding change and continuity over time. Configurations are broken up by new trends and lead to the formation of new configurations – a never ending cycle of breaking up and consolidation.

Processing content

Following the analysis of the type of content, we can proceed to the analysis of how the content was cultivated into higher levels of wisdom.

Figure 12.23: The flow of content from one student. Left: trajectory, scenarios and opportunities. Middle: concept maps and visual diagrams. Right: relational map and future map.

The processing of content took place from the start of the workshop where the groups merged their homework and started to form new relations and structures between the forces, scenarios and opportunities. The workshop culminated in a relational map and the students developed a future map at home. The intention was that this process should allow insights to emerge as the students manipulated the content. To study the emergence of insights the students' output was organised according to:

_ **The individual student**
All the different material produced by a student.

_ **The type of output**
Relational maps and future maps in separate groups.

The objective was to follow the progress of new insights and learn about the types of insights that emerged.

The workshop
The workshop exercise succeeded in integrating all the content without much difficulty for the groups, however the benefit of the individual exercises was not equally rewarding for all the groups. In some cases the concept map of forces and opportunities was enlightening for one group, while the visual diagram of scenarios and forces was decisive for another .

In this way the collection of exercises was effective in exploring the content from multiple angles and allowing the most significant dimensions to emerge.

The quality and composition of the relational map was a direct consequence of the insights derived from the preceding exercises and took many different forms. Elements formed clusters across previous structures and new super concepts arose, such as 'global awareness' and 'all-connected' (Figure 12.25). The relationships between the elements were narrowed down to the most important. In this way complexity was greatly reduced and the level of insight was raised.

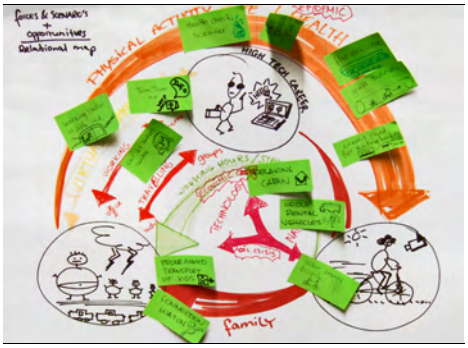

Figure 12.24: An example of a relational map.

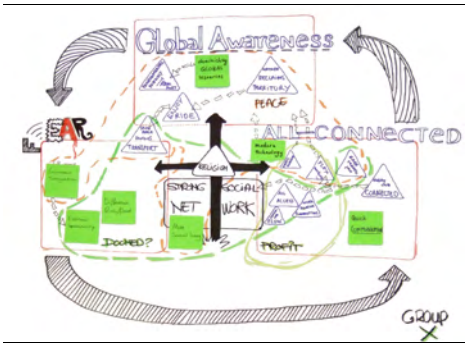

Figure 12.25: An example of a relational map.

Many of the relational maps were mainly structured around one to three essential dilemmas between technology/nature, individualism/collectivism or work/family. The transparency of these relational maps was very high, but too general to produce a rich navigational insight into future innovation opportunities. In fact, the relational maps resembled traditional, overly-reductionistic scenario planning processes which strive to identify two driving force and organize the vision space according to them. Obviously, these groups had been caught up in a mindset in which complexity was obtained by over-simplification and not by uncovering the underlying structures and concepts.

The future maps

The relational map was created in approximately one half hour, and it was up to the students themselves to elaborate it further at home for the creation of a future map. The majority of the students took advantage of the opportunity to make the future map in their own personal way, so the conceptual and visual diversity of the final future maps was overwhelming.

Compression

The content of the future maps was first and foremost different in the amount of information that was embedded and the level of processing. At one extreme there were future maps with very rich information. These future maps were represented as places, i.e. landscapes and buildings, that merely served as organisers of information and made it possible to include an almost unlimited amount of elements and relationships. At the other extreme were future maps based on a single dilemma, which presented the future as a choice between two archetypical scenarios. They contained little concrete information about the relationships between elements and the future innovation opportunities.

Both extremes are examples of the pitfalls of processing the content. Too little processing will result in raw data with little value, while too much processing will over-simplify, so that people cannot get a relevant overview.

The processing of content is oriented towards increasing the viewer's ability both to understand the nature of the field of study and draw his/her own conclusion – or even add new information to see how it affects the overall picture. The dilemma between higher order insights and usability/adaptability need not be contradictory if the transparency is maintained and the arguments for the insights remain clearly detectable.

The challenge of content management is not to avoid falling into any of the two extremes, but to combine the strengths of the two, so that the result is a comprehensive, yet transparent, future map. This can only be achieved by making sure that further compression is achieved by new insights and continuously reflecting upon the level of processing appropriate for a given theme.

Figure 12.26: Mural-like future map.

Figure 12.27: “Dressed for the Future”

Metaphors

The application of a metaphor is a subtle task done with much care. If the metaphor is forcefully adapted to a vision space, it will be misleading. In some cases the metaphor is merely used as a place holder for the vision space, and even though this may be helpful for the memory, there is a danger that the viewer will mistakenly believe the metaphor is relevant on a deeper level (See Figure 12.28).

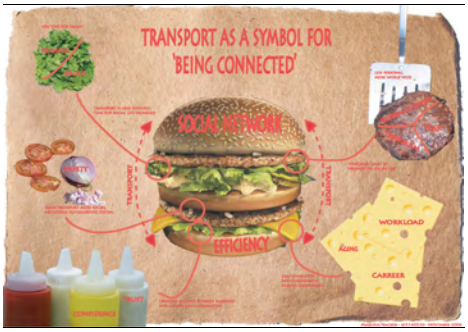

Figure 12.28: future map meal.

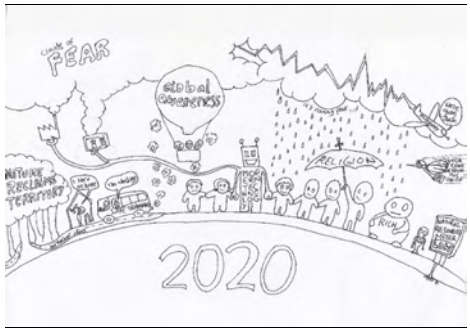

Figure 12.29: Dilemma future map.

Metaphors are such strong descriptors that they potentially break the link to underlying arguments and solely communicate the final vision. These visualizations problematize the future and efficiently communicate the choices that are to be made about the future. They are also strong at persuading and may mobilize stakeholders to action. Such maps are not innovation maps, but examples of how an innovation map may be further transformed for specific purposes.

Dynamics

The purpose of the workshop exercises was to deepen the spatial understanding of the vision space, and herein identify concepts, dilemmas and driving forces that fundamentally shape the vision space. It was therefore not surprising that none of the relational maps included a time dimension or

an understanding of dynamics beyond the immediate relations between the content. Ideally, spatial and temporal techniques should be integrated to form a coherent insight into the future vision space, but given the practical restrictions of the experiment there was no time for additional exercises. The transformation of relational maps into future maps resulted therefore in an overwhelming majority of spatial future maps without an embedded time dimension. However, a few students did the extraordinary and dared to integrate the dynamics of change into the relational map.

Figure 12.30: Living-system future map.

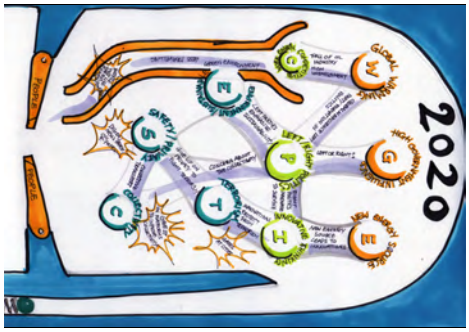

Figure 12.31: A future map game.

A number of dynamic future maps used games as a metaphor for the future vision space. Others were more precise in their unfolding of the future and provided detailed information about the future in regards to technology, society, the everyday and innovation opportunities.

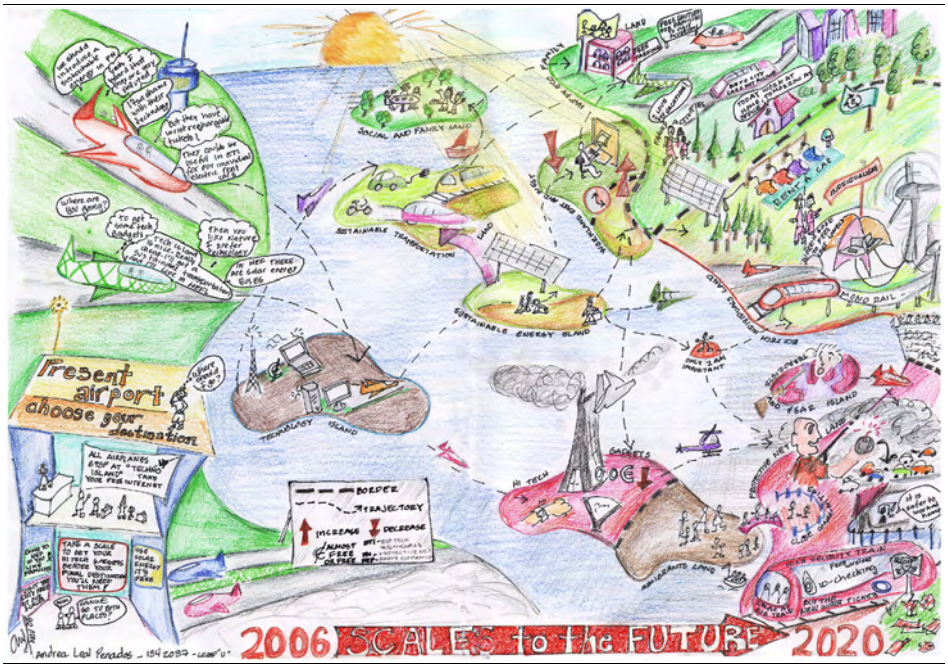

Figure 12.32: Combination of time and space in a single future map.

Discussion

Navigational content

The maps provided overview and insight into the interplay between the most important forces, scenarios and opportunities. The alternation between individual creative assignments and group coordination were effective in generating a rich space of scenarios and opportunities.

The limitations that were imposed on the students, such as the number of scenarios, the format of the future map, and the time available for the experiment, compromised the comprehensiveness of the individual maps. There was only time for the students to develop a scenario within one

aspect, i.e. if the students chose to make a day-in-the-life scenario they only looked into the people perspective and explored the innovation opportunities on that basis alone. However, the group integration assured that several aspects made up the basis of the final future maps.

The comprehensiveness of the map is also measured by how well the theme is put into perspective. In this experiment there were scenarios which questioned the survival of the phenomenon 'commuting' due to new social structures, catalysed by a global epidemic, that might emphasise local, independent communities or new information technology that enables people to meet virtually in a satisfying way. These visions of the future do not lead to new innovation opportunities, but are important to highlight the risks and uncertainties surrounding the whole premise for the theme.

Processing content
The process aims to collapse complexity, but there were also examples where the results were over-reductionistic views on the future. Such simplifications can be meaningful for highlighting certain essential dilemmas in society, but do not provide the desired navigational outcome and understanding of future innovation opportunities.

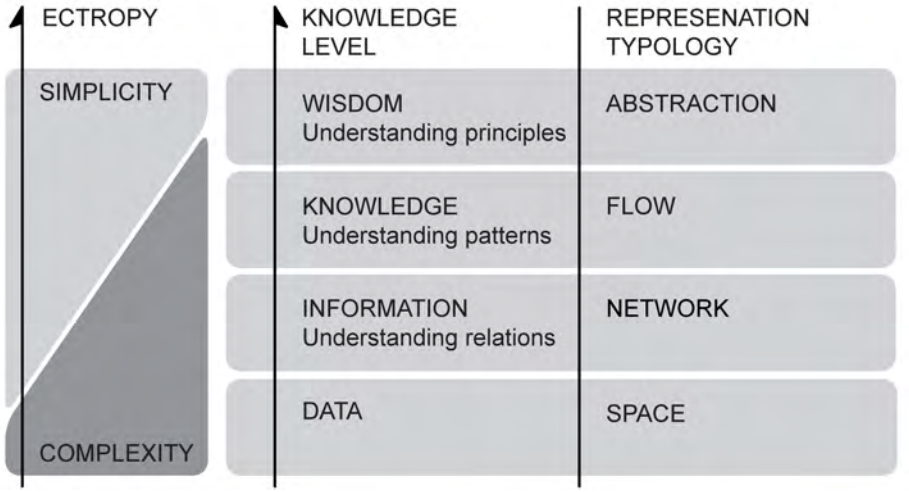

Figure 12.33: Knowledge model and representational typology.

The content processing is more than a simple continuous ladder climbing towards greater insights. The process can either be oriented spatially or temporally in complexity and the results will differ significantly. Ideally the content is integrated across both dimensions, but the combined complexity makes it difficult to perform in a single action and requires both time and extraordinary skill.

Multiple maps
The variety of ontological perspectives increases the quality of the outcome, but also increases the amount of information embedded in the future map and the risk of information overload or over-reductionism. It may therefore be necessary to re-consider the concept of a single future map and allow the final outcome to be represented by several interconnected maps.

Conclusion

The new approach's combination of techniques and perspectives formed a coherent whole that guided the students appropriately through the experiment. The processing of the content by means of concept maps and visual diagrams effectively re-arranged the content and led towards new insights. The insights increased the transparency of the content and collapsed the spatial complexity significantly. Visualisation and cognitive models played a

key role by enhancing the capability to deal with large amounts of loosely connected data and make sense of it. However, the experiment also showed that there are limits to the amount of compression that can take place and the process must be carefully managed in order not to over-simplify the vision space.

The ontological foundation provided a relevant foundation for populating the vision space. The students used multiple perspectives and regimes to unfold the theme and gained a well-founded and representative overview of future commuting activities. On this basis they developed a wide range of concrete future solutions that contained a balanced mix of social and technical innovation.

Next

In the two last experiments the new approaches focused on the cultivation of the content in either time or space. The cultivation has given a more navigational content, however it has become clear that there are limits to the improvements that can be achieved and further processing does not improve the quality of the outcome.

In parallel the definition of the content elements has gradually evolved and a number of perspectives has been introduced. The ability to capture the nature of everyday activities has increased, but there is still the challenge of elaborating these perspectives further and integrating them into a coherent and consistent worldview. In the following experiment the emphasis is therefore put on the definition of the content.

13 RESEARCH CYCLE 4

In the preceding research cycles, a number of approaches were introduced which focused on the definition of the content and how to cultivate it. The techniques for cultivating the content have proven effective in collapsing complexity to a certain extent, but further improvements were found to be contingent on the ontological definition of the content. The findings suggest that the underlying world-view determines the overall complexity of the unfolding, as well as the ability to make sense of the content. The hypothesis of this research cycle is therefore:

> ... an activity-centric approach, based on a constructive world-view, can improve the navigation qualities of the innovation map.

The ontological perspectives that have been introduced up until now share a common foundation in their socio-technical and constructive ontological origins. The perspectives have been shown to capture successfully the contextual, material and co-evolving nature of products and people, and are capable of explaining how the everyday is an integrated element of regimes and product-service-systems. However, there is so far no activity-centric perspective that can explain the elements of an activity and how activities change over time. The hypothesis is that such an understanding could become a unifying nexus for the perspectives which have already been introduced, thereby making it possible to understand confidently the change in everyday activities. It is assumed that the new activity-centric perspective will result in a much more effective unfolding and cultivation of the vision space – and significant improvements to the navigation characteristics of the innovation map.

13.1 APPROACH

Defining content

The research cycles have shown that the complexity in time of a particular domain is greatly reduced if there exist specific ways of interpreting change within that domain. In previous research cycles, the futures of activities have been pinpointed by transforming in time the domains closest to the activities. However, no theory has been introduced that can explain the dynamics of the activities themselves.

Given that activities are the core unit of investigation of modern vision projects, it is therefore reasonable to assume that such a perspective can become the core vehicle of transformation in time and provide a point of reference that other perspectives can converge towards. In the process of developing an appropriate ontological foundation the challenges are:

1. to focus the foundation around the core subject of investigation, i.e., everyday activities, and describe it in a practical and material way which is relevant for envisioning new innovation opportunities, and;
2. to conceptualize the domains in such a way that the underlying pattern are exposed. If the ontology does not extract the essential elements of change and continuity, then information overflow quickly becomes an issue when looking into the future.

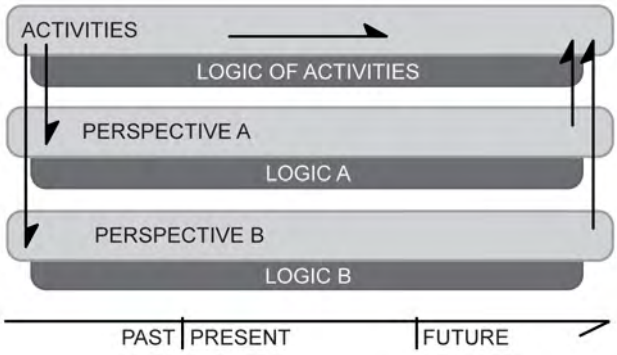

Figure 13.1: The new approach introduces an understanding of the change and continuity of everyday activities.

As everyday life has been studied extensively for more than a century in the field of sociology, an extensive body of knowledge describing this domain already exists. Everyday activities are closely entangled with everyday life, but it was not until after an extensive investigation that a suitable, activity-focused field of research was discovered. The activity-focused field is being led by a group of researchers from the field of sociology, who not only seek to analyse the world as it is, but also to devise new solutions by working with designers. Their primary concern is consumption and sustainability, but they have presented their work under the more generic title: “Practice-Oriented Product Design”. The research is based on the sociological discipline “Practice Theory”, which they have integrated with other areas of research to investigate the dynamics of everyday life and how people, products and the wider context both shapes and is being shaped by everyday life.

Practice theory

A practice is a sense-making ensemble of activities. It is a proven way of approaching a situation, which can be reproduced and successfully passed on to others. There are two key aspects of a practice: the coordinated entity and the performance. A “shared understanding” is the coordinated entity that links activities in certain ways through understandings, procedures and engagements (Schatzki 1996, 89) (Warde 2005, 134). The practice as performance refers to the way a practice is carried out. For a practice to exist, it needs to be reproduced over and over again.

The purpose of practice theory is not to explain every detail of human activity, but to grasp the main patterns that have a significant impact on people, markets and society. Practices are relatively tangible objects which account for the greater proportion of the total sum of human activity. Practices are therefore defining new, relatively stable and lucrative markets. They are also responsible for basic conditions of life and the general qualities of societies. They account for the use of global resources and can be more or less sustainable and promote freedom in different ways.

A practice *“consists of several elements, interconnected to one another: forms of bodily activities, forms of mental activities, 'things' and their uses, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge.”* (Reckwitz 2002). In the context of product design, Shove & Pantzar (2006) have refined this definition into three operational elements:

- **Material**, by which we mean technologies and tangible, physical artefacts
- **Image,** including the domain of symbolic meanings, ideas and aspirations
- **Skill,** which encompasses competence, know-how and technique

It is important to note that practice is not associated with a specific person, artefact, place or time. Bodily movements, ways of doing, and desiring are elements of the practice, its temporal unfolding, and spatially dispersed nexuses. In consequence people and products are also nexuses of several practices.

Practice theory favours the activities of everyday life, which are often considered routine, ordinary, collective or conventional. Typical everyday practices are cooking, working, exercising, leisure, showering, driving and eating. In contrast to recent years of hype around brand, image and identity, practice theory concentrates on the more fundamental and practical issues of everyday life.

Defining activities as “practices” filters out the immense variation of everyday activities. At a detailed level of resolution a person will never live two days exactly the same way, so we need to identify the central elements of activities that are shared among groups of people. The image, skill and material reveal the activity in a way that does not fluctuate at random and pinpoints instead some of the substantive characteristics of the everyday.

Studying dynamics of practices is similar to looking at a bustling whirlpool of converging water currents. In this analogy the spinning water is the equivalent of people, artefacts, families, groups, companies, systems, services and other actors that participate in the performance of the practice. These actors flow from one whorl into the next as they take part of different practices.

Importantly, not all the water is part of a whorl. Events and actions are not always motivated by a shared understanding nor reproduced regularly. These processes, that are not part of a practice, are important for understanding the emergence of new practices. It is in the random and non-structured processes that innovative flows of actions emerge and new configurations of practices are created. They start a whorl – so to speak – which builds in size and strength by enrolling actors in the performance of the practice.

Dynamics of practices

People and products are central players in the processes in which new practices emerge. They are nexuses of many practices and embody a variety of materials, skills and images, which come into play whenever needed. They play an active role in more or less deliberate daily experimentation of combining and re-combining constituting elements of practices and diffusing them across the landscape of practices. In terms of consumer research the process in which people integrate artefacts into practices and give them meaning is called “domestication” (Ingram, Shove, and Watson 2007).

Other important sources of innovation in practice are new ideas and inventions of all sorts. People and products are the gateway for new fragmented ideas to be integrated into meaningful practices. There is no shortage of new ideas in modern society. Innovation is today's business mantra and there is a constant stream of new inventions, technologies, desires, materials, business models, values etc. New ideas are quickly and effortlessly transmitted by internet or other media across cultural and geographical boundaries and embodied by many different people and products. As time goes by people absorb these new ideas, learn skills, develop new lifestyles and combine means and goals in ever changing constellations. Similarly, designers inscribe new meanings, functionalities and forms into products. The study of co-designing processes, by which designers configure users by inscribing meanings onto artefacts, while users, on the other hand, inter-

pret those inscriptions flexibly, and may even anti-program them, has been pioneered by Akrich (1992).

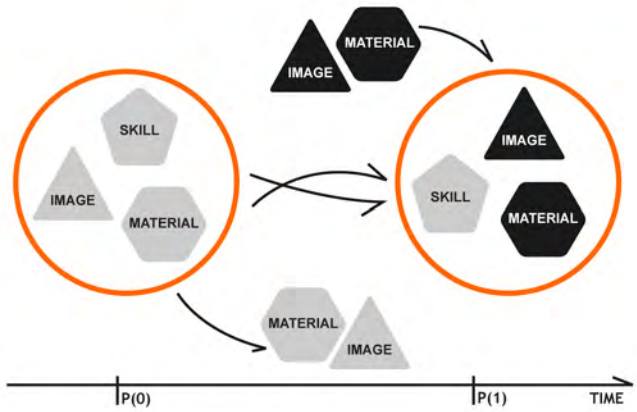

Figure 13.2: The change of a practice.

In general, the emergence of a new practice is a complex hybrid of several simultaneous forces that together drive the practice into a negotiated configuration. The processes of “designing” actors and “domesticating” them into new practices are the two main ways by which new practices emerge and innovation in practices occurs. Typically, over time, the two processes will result in a particular inscription suited to a particular attribution of meaning for an artefact. Bijker (1995) calls this process 'closure'. Shove (2005) points out that it is only the artefact which is apparently stabilized. In her view, understandings are continuously negotiated and change radically from person to person.

Ecologies and systems of practices

Figure 13.3: Overview of the domains of the unfolding.

So far we have focused on the emergence of individual practices, but other practices play a crucial part in the process. They are all part of a wider ecosystem of practices which is the result of continuous experimentation and the merger of practices. The ecosystem is characterized by both cooperative and competitive relationships that in many ways determine the trajectories of the individual practice. For example the relationship between “cooking” and “shopping” is of a symbiotic nature, while “biking” and “driving a car” are mutually exclusive.

Over time some practices gain momentum and shape other practices around them. Practices may adapt to each other and fall into “sync”, which only increases their mutual dependency. These interactions join the practices in complexes of practices that depend on each other for continual reproduction. The accumulated flow of material and products is optimized in product service systems and systems of provision that deliver basic amenities such as electricity, water and infrastructure.

Regimes

Inevitably there will also be practitioners and promoters of practices that share common interest across the ecosystem of practices; to further their common cause they will create both formal and informal networks and organizations. Apart from users and companies, the potential stakeholders include research institutions, finance groups, non-governmental organizations and public authorities (Geels 2005). The networks and systems that emerge from the ecosystem of practices are entities with particular interests, expectations and strategies. Through negotiation with other stakeholders they constitute a landscape of technical, social and economic structures that create rules, regulations, incentives and subsidies to guide the development of new ideas, practices and the ecosystems of practices.

These initiatives may result in the cementation of specific technical, social and economic regimes.

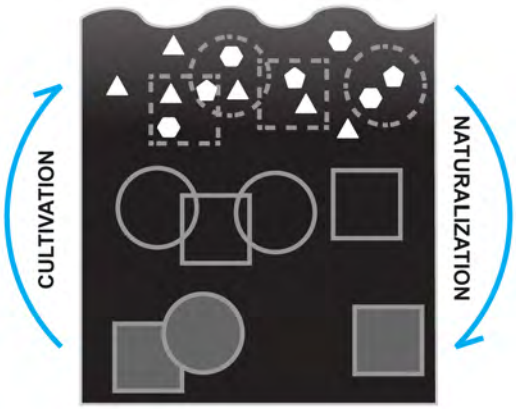

Figure 13.4: The making of practices. The elements of practice float freely between actors and practices. Overtime they consolidate in configurations and stabilize until new configurations emerge.

Though the structures and regimes may seem like self-supporting structures, they depend on the continued reproduction of practices. Structures can therefore only resist a certain level of pressure for shorter periods of time before they must either adapt to practices or perish. Geels & Schot (2007) present a full typology of possible system transition paths.

13.2 SETUP

Workload:
14 days work over 7 weeks

Place:
Technical University of Denmark

Client:
Roskilde Festival

Participants:
5 Design & Innovation master students

Facilitators:
Max Munnecke & Hanne Lindegaard

The fourth experiment was part of the first semester course “Holistic Design”, which is part of the master's program in Innovation & Design at the Technical University of Denmark. The purpose of the course is for the students to experience the product development process in its full length from ideation to production in cooperation with an organisation.

The experiment concerned the first half of the course, which focuses on ideation and identification of new opportunities. The second part of the course takes its starting point in one particular opportunity identified in the first part and details its construction and production.

A group of five students chose the optional assignment of participating in the experiment, thereby volunteering to use a practice-oriented approach for the assignment. At the same time the students attended a course on “Products and consumption in everyday life”, which also introduced them to practice theory. In combination with their socio-technical knowledge from previous semesters they were better equipped than the average design engineer to understand the ontological perspectives introduced in the practice-oriented approach.

Brief

The assignment “Smart Light as a Social Tool” was motivated by the ambition to enhance the camping experience at the Roskilde Festival by means of new light technology.

Unfriendly camp-sites at festival
For several years it has been prohibited to make open fires or grill in camp-site areas at the Roskilde Festival due to fire hazard. Only the main paths that cut across the camp-site area are lit. The light has a cold glow and leaves the camp-sites in dark shadows. The immediate, practical concern is the difficulty of finding your own tent, or the danger of tripping on the fasteners for tents – especially after a couple of drinks. But the lack of lighting also has social and emotional consequences. It is not cosy to sit in the dark shadows, so the camp-sites are deserted in the night and people take refuge in the concert areas. Those who remain at the camp-sites resort to

Textbox 13.1: The Roskilde Festival

Roskilde Festival takes place in Roskilde, Denmark. It is the largest north European music festival and has existed since 1971. The festival is a non-profit organisation which donates the profits from the festival to charity. The music lasts for four consecutive days, while the camp-site is open for an entire week.

aggressive drinking games, because of the lack of a meditative fire to bring people together. In an escalating spiral, the uninviting atmosphere drives more people from the camp-site, resulting in an increasingly desolate atmosphere.

New light technology

In recent years, LEDs (Light Emitting Diode) have been introduced to the mass consumer market. Though LEDs and diodes have been around for some time their price and functionality (brightness and colour) are now reaching a point where they have the potential to be integrated into a variety of uses. Low energy consumption, combined with increasingly powerful batteries, are making smaller, lighter and wireless devices feasible. There are already indications that light is increasingly being used as a decorative, communicative, symbolic and emotional element in people's everyday lives. Light is becoming, in that sense, a versatile new tool that people are using to create new experiences. Light bulbs now comes in many different colours and people design their light settings as much as other elements of their homes. However, people's increased sensitivity and appreciation of light is not widely understood yet. With cheap, new, durable, intelligent technological solutions just out of the laboratory, there is a new space to envision out-of-the-box practices and concepts.

Figure 13.5: Dark camp-sites and aggressive drinking culture.

Figure 13.6: New light technologies inspire new understandings of light.

The objective of the project was...

... to envision new practices at festival camp-sites to create a friendly, inclusive, engaging and safe atmosphere.

The practices should entail concrete products in which new light technologies, such as diodes, are a substantial part of the final concepts. The scope of the project was not defined by a particular group of actors, user experience or contemporary practice. Light could be used in relation to a range of practices at a camp site and a central part of the assignment was to identify such practices. Subsequently, a new practice would be selected as the starting point for the development of a concrete product.

The concrete focus was the camp-sites at the Roskilde Festival, but it was also desirable to develop versatile concepts that would be suitable for a range of situations, such as camping, picnic dinners, parties on the terrace

or in the garden, etc. However, the final concept had to fit the 'nomadic' context of a camp-site and it was desirable to come up with a concept that empowers people to develop their own way of using it – in other words, a product that inspires “engagement”.

Process

The process for this experiment consisted of phases of “deep diving” and value-oriented visioning, like the previous experiments, but because the content was radically redefined each phase included specific tasks aimed at unfolding, populating and integrating the different domains in accordance with the underlying world-view. The main phases were:

1. Definition of assignment
2. Unfolding and population of the present
3. Interpretation of change
4. Value-based visioning of concepts

Definition of assignment

> Sense the intent and identify key issues. The assignment should elaborate the brief and define guidelines to frame the project process.

The original brief is not necessarily a well-structured outline of a project, so the innovation team must first define the assignment in a way that will take them successfully through the process. From the brief, the team can extract information about the problems, potentials, goals, theme, values and issues that motivate the project. Further investigations may be necessary to elaborate these factors and identify a number of anchor-points and key issues that can guide the project process.

The aim is to make the definition neither too open nor too closed. Otherwise the project will be too all-encompassing, making it impossible to go into depth, or so narrow that the outcome has very limited value.

In case the theme is not described as a practice, it is important to transform it into the domain of practices in order to benefit from the approach. For example, if the brief is to investigate vacuum-cleaners, it might be transformed into the practice of “cleaning”.

The scope of the project can also be delimited by creating an overview of situations or activities that bear resemblance to the theme and might be used as references for interpretation or inspiration.

Unfolding and population of the present

> Unfold an overview of the practices and actors relevant to the theme and populate it with concrete information.

Practices and actors are closely interwoven; to disentangle the web, a number of “threads” must be unravelled:

1. Identify the relevant ecosystem of practices and their complexities.
2. Identify the actors engaged in the ecosystem of practices.
3. Identify images, skills and materials across practices and actors.

These threads are not only chosen to document the state of the present, but to prepare the ground for applying different perspectives and interpretations.

Interpretation of change

Track selected key issues and domains back in time. Interpret the changes and extrapolate into the near future.

In this phase, one should look twice as far back in time as one hopes to look ahead. Record the trajectories for each individual domain and key issue.

1. Investigate how elements of practices and ecologies of practices have changed in the past.
2. Track products and people over time and study how their meaning and identity change over time across generations of products and social groups.
3. Identify emerging ideas that are making their way into practices and actors by analysing other themes that bear resemblance to the theme in question.
4. Identify structures and regimes that govern the ecosystem of practices and emerging ideas. List laws, regulations, incentives and subsidies.

Finally, evaluate past trajectories and identify underlying dynamics as well as key events and barriers. Extrapolate past dynamics and creatively envision probable, possible and imaginable futures within each domain and key issue.

Value-based visioning of concepts

Merge insights, evaluate values and develop concepts

The results of the previous steps should provide insight into the patterns of change within individual areas of investigation. Subsequently, these insights can be merged into a collective understanding of how all the different perspectives in union shape the theme in the future. If the assignment aims at achieving a value-based transformation, then this is the time to emphasize those values and explore them in depth.

1. Conceptualize future practices within the theme.
2. Evaluate the practices and determine the values that they represent.
3. Identify the desired values of the vision project, if it was not already done as part of defining the assignment, and compare with the evaluated values.
4. Express the desired values within different domains. Seek inspiration in related themes.
5. Envision future desirable practices and describe product concepts.

Preparation

Everyday life is often difficult to read or talk to people about, because the practices are taken for granted and people rarely reflect on them explicitly. It was therefore desirable to have the innovation team experience the festival themselves or observe festival-goers for longer periods of time to understand their activities. Such techniques are commonly used by ethnographers.

However, the Roskilde Festival takes place at the beginning of July, while the study was planned for the autumn semester, so the course participants were not yet known at the time of the festival. Furthermore, the festival is swamped each year with research requests. The researcher therefore

enrolled himself as a festival volunteer to be able to study the phenomenon without interfering.

The volunteer work consisted of three eight hour shifts patrolling the camp-sites to check for fires or injured festival-goers, and provided ample opportunity to experience everyday life in the camp-site. The atmosphere, everyday activities and, in particular, the use of light at night was documented with photos and led to the initial brief.

13.3 INTERVENTION

Definition of assignment

The students started the project on the basis of the brief and photos taken by the researcher in the preparation phase. After several discussions separated by days for investigation, the focus of the exploration of practices was defined by four parameters:

_ **Theme**
People socializing and using light at the camp-site of Roskilde Festival

_ **Values**
Positive camp-site spirit
Friendly social interaction

_ **Key issue**
Youth culture
The meaning of light
Emerging light technologies

_ **Requirements**
Safety
Sustainability
Accessibility for all

The focus of the exploration was backed up by preliminary analyses of socializing and safety.

Figure 13.7: Defining the assignment by triangulation.

Figure 13.8: Scope of investigation: contexts, social situations and practices.

Socializing
The festival is a large compilation of different offerings of quality experiences, and most of which take place in the company with other people. One key social aspect of the Roskilde Festival is that everyone is equally placed in the same situation. Indeed egalitarianism is one of the things that Denmark is known for. Being together – with both old friends and new – is one of the main values of the festival.

Safety
Safety became a particularly high priority at the Roskilde Festival after an accident during a concert in 2000 in which nine people died due to tramp-

ling in front of the music stage. Throughout its history there have been many different initiatives at Roskilde to put safety first, not only in front of the stages, but also at the camping area. The focus on safety is relevant for this project because light can dangerous if it causes fire, but also because light can improve safety when people move around in the dark.

Figure 13.9: Analysis of socializing.

Figure 13.10: Analysis of safety.

Similar situations and activities

A brainstorm was conducted on situations or activities that share the three characteristics of the theme: function, space and socializing (Figure 13.8). Below are the main results described:

Crowd movements during the Roskilde Festival are similar to movements at other open, outdoor exhibition areas, such as trade fairs or conferences. A trade fair spans a large area, with different exhibits in different locations. The visitors walk from exhibit to exhibit, according to their individual interests. The music festival is constructed very much with the same structure, and the different zones are created with the diversity of the visitors in mind.

The festival also resembles a parking area, because it is a large expanse, with different places arranged systematically. Finding one's car in the dark, is challenging without light and some directions. Likewise, at the music festival, finding the location of one's tent in the dark is challenging without adequate light and directions.

Flea markets also share many similarities with the music festival, both in terms of space and social interactions. As at the festival and the trade fair, the visitor needs some guidance to find what they are seeking – the different booths and amusements, among other things, in this case. Many markets are also open after dark and therefore have the same challenge of making the space navigable in the dark.

Complex urban transportation systems, like subways, are another practice with navigational challenges. The complex maps of metro systems explain how to get to a certain destination, often by several different routes.

From the perspective of function, the practice of holiday camping is extremely relevant. Camping in nature or camping at a festival are almost the same, in terms of doing things in the dark. Scout camps, in particular, have much in common with festival camping, as they both involve elements of socialising.

Unfolding and population of the present

As a first step, the general practices at the festival were unfolded. The activities at Roskilde Festival are spread over eight days, and therefore become part of the guests' everyday lives for that period of time. The activities can thus be considered practices.

The most common practices are sleeping, cooking, eating, talking, walking, etc. As the theme for the project was “Smart Light as a Social Tool”, the focus was placed on the social effects of light in the camping area of the festival - and not on activities in the concert areas.

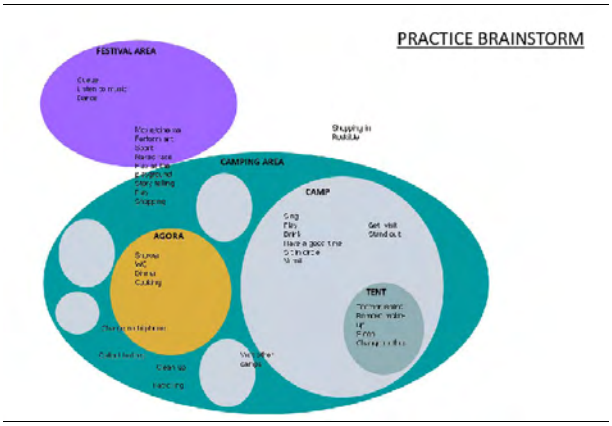

Figure 13.11: Unfolding practices.

When the festival guests first arrive, the must do certain activities, such as getting a wristband, finding a place to make camp, and transporting luggage and supplies. Thereafter people prepare their camps, erecting tents, arranging living areas, unpacking sleeping bags, and so forth.

Since the practice brainstorm was divided into five topics, the description of the practices at the festival were also divided into them as well. Several of the identified practices could be located both at the festival area and at the camping area. A variety of practices go on at the festival, not all of which will be presented here. The festival area is a controlled area filled with different activities, such as concerts, merchandised stores for shopping, and a huge range of different food stalls. At the camping area, many different practices happen. These may include, for example, playing, cooking, drinking and listening to music.

In communal zones – so-called 'agoras' – the festival-goers also cook and socialise. They drink beer and play music and games. The agoras are also where the toilets and service centres are placed. In the service centres mobile phones can be rented for a fee of 10 DKK. At their private camp-sites, people also listen to music, drink beer and have a good time with each other and the people who visit their camp. This is the place where people sleep and spend most of their time during the first four days. In these days people are doing a lot of different activities to make their camps look attractive. This may, for example, include painting flags and building chairs out of beer crates.

In-depth analysis of key practices at the camp-site

The students found through interviews with former festival guests and staff, that the social life in the camp before and during the festival was very important to the guests. The practice of socialising in groups is involved in many different aspects of the camp area, which will be explained in the following.

Roskilde Festival has many different visitors; depending on their sub-cultures, they socialize differently. An analysis was conducted to identify the main types of people (Figure 13.12).

The 'scouts' and 'hippies' are the people who spend a lot of time sitting in circles, singing and playing guitar. The scouts are outdoor types, who often own different kinds of products made for use in nature. They tend to have more skills for surviving in nature, and are practical-minded. The hippies also play guitars and other musical instruments as a form of socializing.

They tend to be laid back, and openness is an essential factor for this group. The 'camping people' bring lots of camping paraphernalia, like chairs and cooking gear to use in the agoras. They mostly stay in the caravan areas, or other quiet areas. 'Punkers' and 'technos' are characterised by having strong relationships to their groups. For both groups, it is important to send clear signals to others about who they are. They play recorded music in their camps, but do not themselves play acoustic music. The 'bling blings' are characterised as focusing a great deal on their visual appearance, through fashionable clothes and gadgets. They also socialize through beer drinking, but also a significantly larger assortment of alcohol. All the different groups of people socialize in the camp around different objects (Figure 13.13).

Figure 13.12: Different people at Roskilde Festival.

Figure 13.13: The objects in the camp-site context per sub-culture.

They all have interests in being part of a group. Being part of a group is strongly connected with another key practice – standing out – which at first glance may seem contradictory. Standing out expresses the importance of being recognized as an individual, either alone or through association with a group. The festival normally consists of about 70.000 participants, none of which want to be a reduced to a figure in the mob. They differentiate themselves through their relations to different types of people and through the way they socialize. All the different groups personalise their camps in order to stand out, but indeed also to feel connected to a community. Being in an area with so many different people creates a need to belong to a certain group..

The camps are personalized by the use of different artefacts, such as banners, flags, the building of different objects, drinking equipment, etc. Standing out is also, for some people, achieved through their choice of clothes. Some guests prepare different kinds of artefacts to create a theme party, or just to personalize their camps. To stand out among the rest, skills are needed to identify new tendencies. The festival is known for setting new trends and exposing emerging tendencies in the market. Standing out is also part of the next key practice: having visitors to one's camp. By standing out, the different camps attract other people's attention, whether by walking by or through word of the mouth. This practice is also a form of socialising, because its implicit aim is to make people want to join the camp, or simply create a memorable impression. Different artefacts are used, and the social activities are in themselves a way to communicate a message to passersby, or create curiosity, which might result in more people visiting the camp. The different artefacts used to encourage visitors can be incorporated into many activities. It is often of great importance to have a drink to offer, a nice chair, having music in the camp, or some kind of interesting light show or similar gadget.

Four key practices were chosen for a detailed analysis: young people socialising in groups, visiting other camps, having visitors in your camp, and

standing out. The analysis investigated the understandings, skills and material that each practice consisted of.

Figure 13.14: The practice of "having-visitors in your camp".

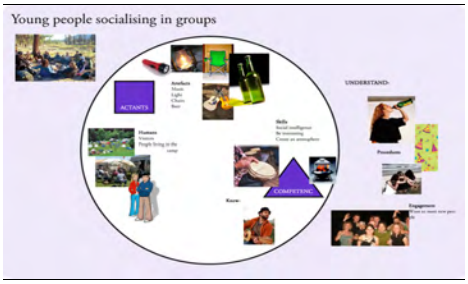

Figure 13.15: The practice of “young people socializing”.

Figure 13.16: Day in a life story.

Integrating actors and practices

Having listed the characteristics of people, the objects and practices of the local context of the festival camp-site, the information is growing but lacks connections. In order to logically bind the information together the students investigated how these elements played together throughout an ordinary day. (Figure 13.16).

The use of light

The students also investigated the use of light at the festival. The analysis covered all the main areas: the festival area, agora and the camp-site.

It was found that the organisers use plenty of light in the concert area, from stage lights for the performances, to stall lighting to illuminate merchandise and tables, to lighting on information signs to help people navigate. In the concert area, light is also used as art, e.g., a big floating balloon with multi-coloured lights inside.

The agoras are also illuminated by light bulbs strung on wires. Service centres and service towers are lit as well. The light in this area is used for orientation and the light bulbs create atmosphere. The camping area and the paths are, in general, not well illuminated. On the paths, one is lucky to find a lamppost here and there. People therefore wearlight on their clothes and some even walk around with glow sticks on the path areas. Light in the camps is limited to what people carry with them. Here flashlights, mobile phones and lanterns are mostly found. These types of lights are used for locating things in the camp and in the tent, and for making a welcoming atmosphere.

Figure 13.17: Light at the camp-site and festival area.

One camp had their own LED signs for Roskilde Festival 2007; according to camp members the signs attracted many visitors, who came inside their party tents which were equipped with battery operated light shows and hi-fi equipment.

The last key practice is 'finding lost stuff'. This practice involves the functional aspect of light in the camp. To navigate in the dark, many people use their mobile phones or flashlights. Some buy flashlights at the festivals, while others bring them from home. Often a single flashlight is used to light up a whole pavilion, by hanging it from the top of the pavilion structure.

Actor network analysis

The unfolding of the actor-network was performed with the new, imaginary social tool as the starting point. The users of the festival are main actors because they are the ones who need to accept the product. It is therefore important to clarify the group of users, or types of festival guests, as well as the rest of the people at Roskilde Festival who might be possible users, whether through direct use or indirect experience. The Roskilde Festival Charity Society, the non-profit organisation behind the festival, is a main actor as well, as the product must be suited to their norms and values, as well as be profitable.

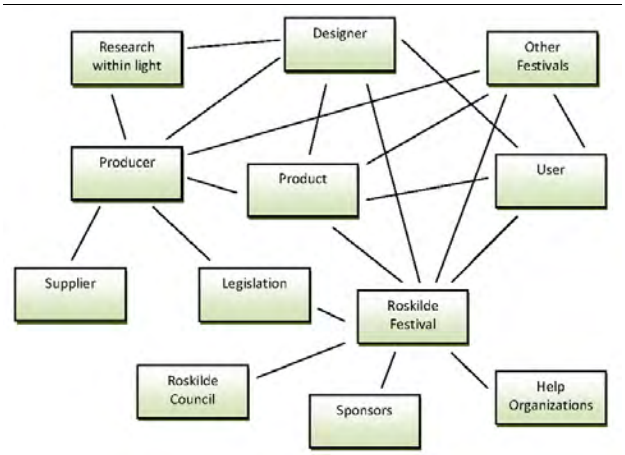

Figure 13.18: Actor network analysis.

The eventual manufacturer will be an important actor as well, because it will need to be convinced that the product has market potential and the potential for good branding. The designer is another important actor who will try to influence the network, and therefore needs to have a deep insight into the network in order to change it in a meaningful way. Another important element is to study competitors, such as other festivals, to gain awareness about existing problems or products. Research within the area of light is important in terms of clarifying trends and possibilities within the technology. The different kinds of legislation must also be considered, for reasons of environment and safety. Safety is an area of special importance for the Roskilde Festival, because of the fatal accident in 2000. The sponsors, Roskilde Council, and help organisation are other actors within the network.

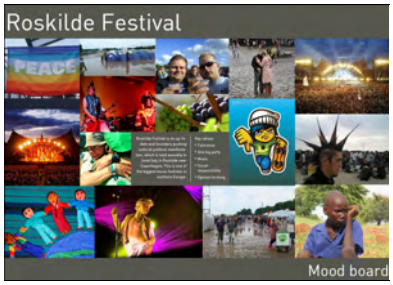

Figure 13.19: Values of the Roskilde Festival.

Figure 13.20: The regime surrounding the Roskilde Festival organisation.

The actor network analysis disclosed the following configurations:

_ **Safety regime**
Police, Fire department

_ **Altruistic regime**
Non-profit organisation, volunteers, free entry

_ **PPS system**
Organisations, volunteers

Interpretation of change

The choice of vehicles in time involved several aspects. The vehicle should include the most important aspects of the theme, at the right levels of resolution, and cluster them appropriately.

The unfolding of the theme showed that the current theme contained at least five levels of resolution of practices, ranging from general practices at the festival, practices at the camp-site, social practices at the camp-site, and finally, social practices at the camp-site with the use of light. Each of these levels could be studied by the basic elements that constitute them and the actors that perform the practice.

Over time all of these aspects co-evolved, but the overall complexity made it impossible to track all of them at once, so a limited number of practices and elements had to be selected for detailed study and transformation in time. Subsequently, these vehicles were integrated in time into future visions and concepts.

The group decided to consider the theme at two levels. First, the theme was considered to be part of the general ecosystem of practices at the festival. This view assumed that the practices at the camp are closely related to other activities at the festival, and therefore must be analysed within that context. The most important elements of the practices at the festival were seen to be people's lifestyles and the regime that surrounds the festival. Secondly, the theme was considered part of general practices with light, which are shaped by people's perceptions of light – or the 'meaning of light' – and the technologies available for producing light.

Social practices with light in camp:

Ecosystem of practices at festival

_Regime at Roskilde Festival

_Lifestyle

Practices with light

_Meaning of light

_Technologies

The transformation in time is conditioned by the ability to uncover underlying patterns of change. Some domains have already been studied and theories of change and continuity already exist within practice and regime theory, for example. The fields that remain unknown are open to interpretation, allowing for ad hoc theories to be developed through the study of related areas, as previously described.

Technology
The technical evolution of light sources was one of the main motivations for the project and is described in the brief. With new technologies, like LEDs, it is possible to make directional light in any colour at a relatively low price. The size of the light source and the low energy consumption make it pos-

sible to design miniature products with new functionalities. Such new products are finding application in many everyday situations (Figure 13.21). The technical evolution of light products is currently driven by advancements in light sources and power supplies. Both aspects are tracked in the timeline diagram shown in Figure 13.22.

Figure 13.21: Overview of contemporary LED products.

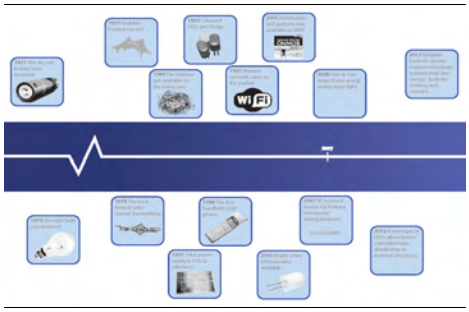

Figure 13.22: Light and battery technologies over time.

The meaning of light

Technology is not the only source of innovation. New practices can also come about through changes in how people perceive light. ”Understanding”, which is one of the three elements that make up a practice, can therefore be decisive in the evolution of practices that involve light.

The initial analysis gave an overview of all the different uses and understandings of light (Figure 13.23). Light is traditionally used for the practical purpose of making it possible to be active at night. Herein, light is important for avoiding physical injures when moving around in dark buildings or public spaces.

Light also speaks to people's emotions and states of mind. Fires and candles, for example, may have a meditative effect and create a cosy atmosphere. Today, artificial light comes in every colour and is used to create romantic, scary or uplifting moods. Light composition has turned into an art form that not only enhances buildings and public spaces, but can be the main attraction in itself.

New research into the therapeutic effects of light promises further evolution of practices involving light in the near future. On the other hand, the popularity of light also causes problems in the form of light pollution. In many cities around the world the human use of artificial light is near critical limits where it has become an annoyance to natural life. The evolution of the meaning of light was recorded on a chart (Figure 13.24).

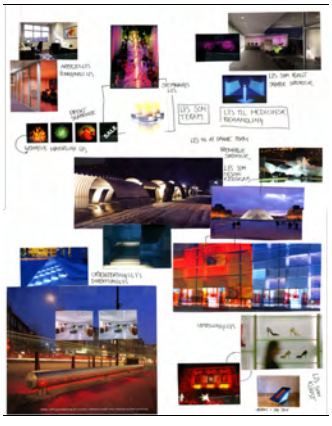

Figure 13.23: Overview of different uses of light.

Figure 13.24: Changes of meaning of light over time.

The festival organisation

In the early 1970s Roskilde Festival was proud to exempt itself from the society's conventions and norms. However, over the years, the festival has conformed with respect to security and safety standards. That was particularly true after the accident in 2000, when its voluntary management was questioned in court, and the festival sought to establish alliances with public authorities, such as the fire department, police and doctors.

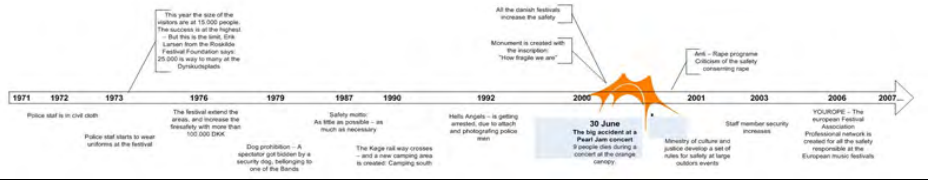

Figure 13.25: The evolution of the regime surrounding the Roskilde Festival organisation.

Culture

The present diversity of sub-cultures at the festival has already been unfolded. Next is an historical overview of how cultural characteristics have developed and changed since 1971, when Roskilde Festival started. The general trend show that people in the 1970s were politically active and concerned about society, whereas since the mid- 1980s they have generally been more focused on consumption and personal identity.

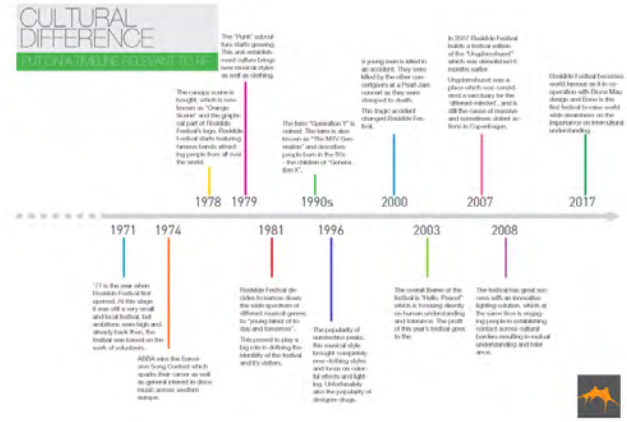

Figure 13.26: Change of culture over time.

Mapping the ecosystem of practices at the festival

A map of practices was constructed by following the trajectories of different practices over time. The selected practices were: entertaining yourself and others, socialising, standing out, relaxing, and weatherproofing the camp. The trajectories were constructed first by analysing the past and present of the practices. Then the observed changes were interpreted and an understanding of the underlying factors was developed. Finally, the present state of the practices was extrapolated into the near future.

For this last task the project group used information collected through workshops with former festival goers, interviews with festival management and articles available in print or on the web. The information was organised on sticky notes with headlines and cut-out images.

Entertaining yourself and others

In the beginning of the 1970s hippies were in their heyday and that was reflected in the behaviour at the festival. Instruments like guitars, tambourines, bongo drums, etc., were brought to the festival and large groups in the camping area played and sang to entertain themselves and others. Around 1975, people started bringing portable transistor radios to the festival. Later

on, in the early 1980s, “boom boxes”, or “ghetto-blasters”, arrived at the festival. These devices provided a much more powerful amplifier, making it possible to entertain a larger audience. Another important feature of the boom box was the integrated cassette player which made it possible to bring your own music.

Starting in the 1990s it became widely popular to build your own hi-fi trailer, consisting of a powerful amplifier, cd- or mp3-player, and big loudspeakers powered by one or two 12V car batteries. Looking at the evolution of how people began to bring their own, pre-recorded music to the festival, it is obvious that a new practice emerged. The trajectory shows how the personal transistor radio evolved from a personal device with very limited reach into a powerful device for entertaining larger groups of people.

It is expected that the technological evolution will enable people to build bigger and more powerful hi-fi equipment. Naturally, this equipment will eventually reach a level where the performance is sufficient, and afterwards it will stabilise. The urge for entertainment, however, will persist, and people will find new ways of competing in building impressive equipment to bring to the festival.

Socialising

One of the biggest aspects of Roskilde Festival has always been the social element. In the beginning, it was the main reason for visiting the festival – the music was just an excuse for people to socialise. Later on, as the festival became more popular, the focus changed towards booking famous bands. In the course of a few years, the festival's focus shifted from socializing to the music experience. In the beginning of the 1970s the festival was mainly an event where everybody was more or less friendly with each other and there were no distinctly different groups of people. But in the late 1970s and early 1980s the festival began to attract visitors from other sub-cultures, like punkers, rockers and “regular” people. The “everybody socialising with everybody” culture disappeared as the different sub-cultures mainly socialised with their own. During the 1980s and 1990s the cultures became even more individualised. Socializing was still important, but now it happened more strictly within sub-cultures of like-minded people. In response to that trend, the festival decided in 2008 to actively encourage sub-cultures to mix through the creation of small communities centered around agoras. For this purpose the camping area was redesigned and an online communities was created. The idea was to create unique communities where everybody knows everybody and socialises with each other regardless of style, politics, age, nationality, etc.

This trajectory is expected to continue in the future. The agora-centered communities are powerful tools for facilitating social interaction between groups that would not meet otherwise. These communities also result in more activity at the camping area.

Standing out

The importance of being an individual and expressing one's opinions has always existed at the festival. Throughout the festival's history, visitors have expressed themselves by writing and drawing on their tents and creating flags and banners. In the beginning, cars and buses were allowed at the camp-site and they became the scenes for parties. In addition, people fenced off their camps and brought furniture and other goods. Today it is forbidden to bring any type of furniture except camping chairs, and it has become a sport to smuggle furniture in. Big items like football tables are smuggled in just to get the attention of other camps and people passing by.

As the festival grows, the variety of visitors is also expanding. In the beginning of the 1980s people differentiated themselves through their clothes, make-up and personalities. Clothing styles have changed overtime. In the 1970s,clothes communicated a laid back attitude. In the 1980s, specific clothing brands started to become popular in conjunction with more individualised societies. The 1990s focused even more on individualism and unique appearances – especially in the mid-nineties when euro-techno culture was at its height. Today, in the beginning of the 21st century, a unique clothing style is important, but is not enough in itself. A specific message needs to be attached, or lay hidden behind. As Danish society became wealthier it became trendy to show that you support a cause or have an opinion on an important matter, often regarding global challenges.

When looking at the trajectories it is clear that expressing one's individuality has been an important matter since the festival was first launched and expressing ones opinions on contemporary issues is part of that. In the 1970s it was through political songs. In the 1980s the statements moved on and merged with special clothes, e.g. the punk style of wearing badges embroidered with provoking statements. The 1990s were more relaxed regarding politics, but new technologies made it possible to stand out from the crowd in other ways.

The students predicted that the desire to stand out wouldpersist. Their vision for the future was that “taking a stance” is on its way back. There is already strong evidence of this tendency in the popular charity products like Apple’s “Product Red” iPod, the “Live Strong” wristbands, etc. In other words, it will become increasingly popular to communicate a message – either through the individual or as a group.

Figure 13.27: Developing practice trajectories.

Relaxing

When the Roskilde Festival began guests sat down at the concerts. That reflected how attitudes were at the festival then; everything was more laid back and built on socialising in a quieter way. Flowers in the hair and bare breasts were also quite a common thing. There was more time between the concerts, and it was easy to find a spot under a tree where you could relax. In the 1980s the number of visitors increased dramatically and the selection of activities in the festival area increased with the number of participants. During the 1990s the festival area changed in character from being a place where you relaxed, to a place where you were active. That meant that people needed another place to relax, and that became the camp. In the late 1990s the festival started to erect different installations in the camping area as meeting places that people could sit, lie and relax on. In 2005 the

festival created the first agoras as part of that same trajectory of creating meeting spaces and smaller communities within the camping area.

In the near future, the practice of relaxing in the camping area is expected to become more common, but there is also the possibility that it could disappear if the agoras and festival area become more active and engaging.

Protecting the camp against the weather

Weather has always been the festival's nemesis, particularly in 2007 when the number of people who left the festival before it ended was the highest ever. The visitors have always brought different things to protect themselves from the weather, beginning with large umbrellas to protect against sun as well as rain. Later on the cheap pavilions arrived on the market in the late 1980s and they quickly became an indispensable part of the interior of a camp. Quickly the pavilions evolved into another form of personalisation.

We expect that the pavilions and infrastructure of the camp will increasingly meld together with the practice of personalising the camp. The cheap pavilions used today will be replaced by similar products, supporting a higher degree of personalisation.

Preparation

One surprising finding of the analysis, was that the guests increasingly prepare for the festival. In the 1970s visitors were allowed to bring objects to the festival, e.g. furniture of different kinds, like chairs, sofas and even cabinets were brought to the camp area. As a consequence there was a big problem as the number of visitors rose with things being abandoned after the festival. Today it is forbidden to bring furniture and other large and heavy objects, due to security and the problem of cleaning up after the festival.

The general problem with things being abandoned after Roskilde Festival led to the emergence of a new practice, called the "after party" at Roskilde Festival, during which the "garbage" left over from the camp is collected for reuse, sale, or donation to different charity organisations.

Visitors' preparation before the festival has gotten far more complex since the early 1980s. Nowadays different roles are delegated among the participants; some people are ready at the opening of the camp area, equipped in running shoes and ready to sprint into the area to occupy a good location. The other members of the group carry the rest of the luggage for the camp.

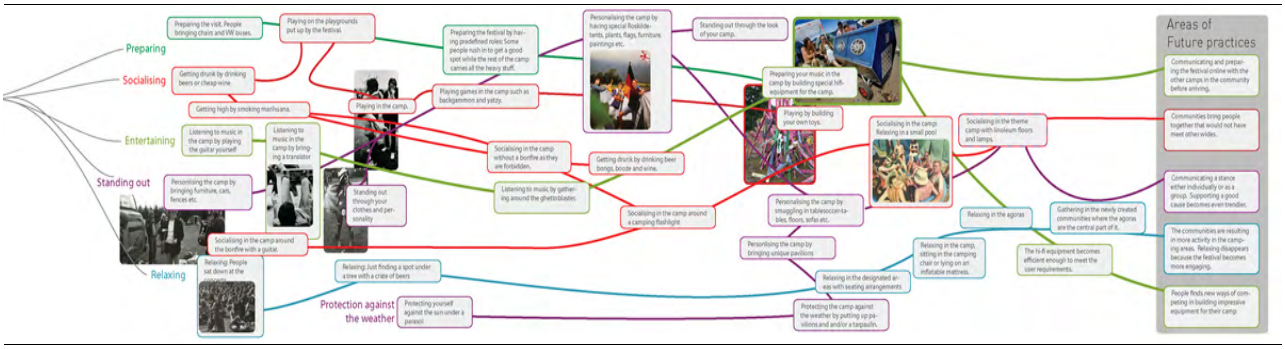

Figure 13.28: Map of general practices at the camp-site.

In the near future, the guests will continue to organise and prepare themselves for the festival. With the local communities that were launched at Roskilde Festival 2008, including the online communities that are accessible before the festival, people will organise themselves even more than before. The community structure makes it possible to layout whole areas and split land between the different camps even before the guests arrive. A new practice might then be communicating with the other camps before

arriving at the festival. It might work as an extremely efficient icebreaker and contribute to a more socially engaging festival which lasts beyond the official eight days.

Value-based visioning of concepts

Figure 13.29: Visual representation of value mission.

The previous sections have developed an understanding of the future practices at the festival camp-site and future practices with light. The project's theme is placed at the injunction of the two practices and is assumed to be shaped by both practices. The next task is to build on these insights and creatively envision future practices within the field. The creative process was guided by the main values identified during the definition of the assignment, but to elaborate and translate these into operational terms, the group held a workshop.

Value workshop

The workshop was conducted by an external consultant and was based on visual associations of images with values. According to the definition of the assignment the main values of the project were to create a positive camp-site spirit and a friendly social interaction. The workshop translated these into three concept directions: engagement, individuality and community, and communication.

Figure 13.30: Value and vision workshop.

The workshop further emphasized the importance of socializing and gaining attention from others at the camp area. It was important that the product should create a feeling of community spirit at the festival, while remaining part of a larger network. It must also require user interaction. Finally, it had to be uphold Roskilde Festival's values and emphasis on sustainability. All of these values were used to guide the following brainstorm.

Conceptualization

The conceptualization consisted of several iterations of brainstorming and refinement of ideas. The envisioning of new practices was guided by the concept direction from the value workshop and inspired by the future envisioned in the phase of interpretation.

The central theme of all the concepts was social activities with light in the camp. However, the brainstorm was not narrowly constrained to this theme, in order to allow a greater number of potential ideas to inspire the concepts. Gradually the ideas were developed and new concepts for activities in the camp-site emerged.

The concepts were presented through user scenarios, because that is the most appropriate way to present the flow of actions that characterize an activity. The performance of an activity usually involves the participation of several people and products, so a concept concerns the whole configuration of elements that play a part in it. However, as the next part of the project entailed developing a concrete product, the group developed a range of activity concepts with a strong bias towards product solutions.

The concepts

The following concepts are a little sample of the activity concepts the students developed:

- LED-bonfire: Groups of people build glowing sculptures with lamps that pulsate, when they are connected.
- Ball-in-camp: A ball is attached to the top of a pole with a string. People swing the ball so it goes around the pole, generating energy that lights the ball.

_ Light-support: Necklace with lights that show which charity you support.

_ Kick-pole: A pole generates light, when it is hit.

_ Rocking chair: Rocking chairs with a generator for lighting the camp.

_ Pavilion concept: Pavilion with solar cells that store energy for light in the evening.

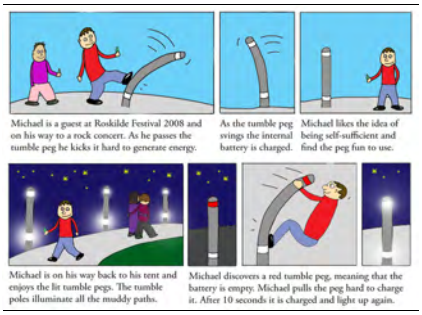

Figure 13.31: Kick-pole.

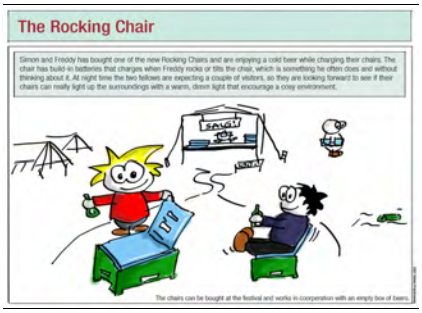

Figure 13.32: Rocking chair.

Figure 13.33: Pavilion concept.

Prototype development

The first part of the project – and thereby the experiment – was concluded with the exploration of concepts. However, the course program also included the selection of a concept and a detailed product development, so a concept was selected on the basis of evaluation criteria and feedback from key persons in the project. The concept selected was based on the LED-bonfire concept, but integrated several ideas from the other concepts.

The main idea was that people should be able to build glowing sculptures with lamps that pulsate when connected to each other. It could create a social practice in which some people would play with the construction of the structure – or “fire” – while others could relax and watch the show. The construction was intended to be an “icebreaker” between people who are shy, while giving the more active people something to do other than competing in drinking games. The concept favours people's creativity and would create a positive, non-competitive atmosphere between people.

Figure 13.34: Cosy social interaction.

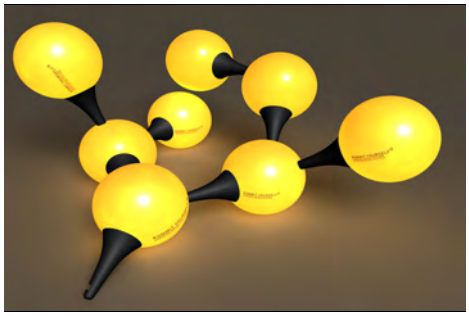

Figure 13.35: Cluster of lights. The light pulsate when the lights are connected.

From a distance, the dark areas of the camp-site would be lit by many unique sculptures that could help people find their way in the dark. The lights would also increase the sense of security in the camp, by indicating where help could be found if a stranger happened to follow you back to your tent at night.

The product idea also incorporated a humanitarian message: proceeds from the lamps would support the charity theme of the festival. The lamp was named 'Kommit', inspired by the catch phrase, 'commit yourself'. As a

proof of ownership the Kommit would come with a wristband with a unique name on it, matching the name of your specific Kommit unit. At the same time, the wristband would work as an accessory, showing that its wearer supports charity.

The lamps would be rented from the Roskilde Festival Charity Society for the duration of the festival for a fixed price and could be freely re-charged at a central location, where the festival goers themselves would generate the energy on stationary bicycles. The efforts that went into re-charging the lamps would not only send a message of sustainability, but also make the light itself more precious, because it would be, in a sense, a part of yourself.

13.4 FINDINGS

Evaluation

Group evaluation

After the examination the students received an email with a questionnaire for evaluation of the project. Four out of five team members responded. The general opinion was that the combination of learning a new approach and detailed development of a final concept had been demanding. Fortunately, the group had worked well together and overcome the difficulties through hard work.

One problem was the difficulty defining the assignment, which added to the complexity and time pressure.

> *"I liked the fact that we tried how it is to move around in the Fuzzy Front End, to see how difficult it is to limit and choose focus through such a process." [Student 4]*

> *"I remember that there was a lot of questions about our not very good defined project delimitation. I remember I found it difficult to make a project delimitation." [Student 3]*

The students thought that it had been difficult to understand the practice-oriented approach and would have liked more time for the first part of the project. Initially, they had difficulty seeing how the different project elements were connected, but when the practice map was put together they understood what it was all about.

> *"I remember somewhere near the end of the project ... and suddenly all the pieces started forming the full picture." [Student 2]*

The methodology was considered appropriate for the assignment, as they felt that it was able to address the theme effectively and produced better results than traditional methods.

> *"Practice theory helped us work with something, that there was no specific market need for (yet). The result would probably have been a more practical and less innovative product if we had used our traditional methods." [Student 2]*

> *"I think that this approach was the perfect one to use, because the assignment was to use light as a social tool at a festival this makes the focal point the activities." [Student 4]*

In the end, the students appreciated learning the approach and thought that their efforts had paid off. They felt that there was more to learn, but that they had acquired sufficient proficiency to use the approach in future projects.

> *"I learned enough to use elements from it in my future projects, and I probably would be able to conduct a process similar to our own." [Student 2]*

“Actually, I think I will be influenced in all my coming projects by this approach, and maybe to some extent use it all the time.” [Student 4]

Facilitator facilitation
In the first half of the project there were difficulties narrowing the assignment so that a focused investigation could take place. The brief defined the assignment within certain constraints, but the students were reluctant to limit themselves and kept the scope too open for too long. The investigations therefore became too general and pointed in many directions which made it difficult to orient themselves.

The overall aim with the course was to develop a final product in detail, so the time the students spent on exploring future practices directly reduced the time they could spend on prototype development. The two objectives were very different in the sense that one was about comprehensively mapping an entire field, while the other was focused on elaborating a single concept. The two objectives compliment each other, but since they involve different states of mind, they should be performed separately and not simultaneously.

Analysis

Before analysing the outcome, it may be useful to clarify what the outcome consisted of, because it was the project team's first opportunity to make an in-depth analyses. The number of domains and perspectives resulted in a number of outcomes that were cultivated, but which also maintained their relevance for understanding the background of the main conclusions. The students were not asked to condense all of the content into a single map. The map of practice at the festival is a central map, but it is not a summary of the collective insights derived from the project. The following outcome is therefore considered to encompass all the different analyses, insights, explorations, concepts, etc.,created throughout the project.

Unfolding
The unfolding and subsequent serial transformation in time of the selected domains – with practices at the core – provided a rich, but also closely integrated, understanding of the future activities.

Initially, the challenge was to envisage the multitude of ways to unfold the specific theme. People are trained to think on very general, or macro-level, terms before they investigate the specific. This practice-oriented approach, on the other hand, starts with the specific and only on a needs basis is unfolded towards the more general.

The unfolding in this experiment was based on the identification of key issues. Without these key issues one would easily get lost in the myriad of configurations and arrangements that practices and entities are part of.

The experiment showed that there is plenty to unfold when investigating the local context. Any practice is part of a complex web of practices, e.g. the practices at the camp-site are part of everyday practices at the festival and, even more generally, social practices in society. Each practice involves many entities that are part of various arrangements. All the things at the camp-site, whether in the tent or in a trouser pocket, form different configurations and take part in the performance of practices.

The extension of everyday practices into the domains of regimes and PSS's were decisive for the outcome of this experiment. Over the years, the “safety” regime has developed into a factor that influences many of the activities at the festival, and in fact it was one of the main motivations for the theme of the project. The PSS was also an important domain to include

in the project and inspired concepts on communal recharging, device rentals and the inclusion of humanitarian messages, thereby adding significantly to the concepts' values of being sustainable, accessible to all, and raising people's awareness.

Mapping
Building the visions of the future on projections from several domains which in themselves were understood in detail, formed a robust foundation.

The overall result is a representative and balanced – even comprehensive – overview of the possible futures which correspond well with the natural variation of everyday activities.

The central map of practices at the festival can be regarded as representative of how different practices can be unfolded with the support of additional perspectives. All the supporting investigations were useful for an ongoing reflection upon the organisation and development of ad hoc initiatives.

The supporting investigations are transparently interwoven with the map of practices and enable the organisation to continuously adjust the picture and obtain the desired “fluidity” of the innovation map.

Concepts
The concepts developed in the conceptualization phase showed that it is possible to design “practices”. The user scenarios competently communicated the essences of the practice concepts and outlined the future innovation opportunities.

The unfolding of the ontological foundation was reflected in the final concepts, which integrated innovative technologies, lifestyles, product-service-systems and charity into a single, coherent concept of a practice.

The students summarized their experience like this:

> *'Kommit is an innovation, which has been developed with the use of a new practice-oriented approach. By using this approach, it has been possible to focus on the activities/practices and their dynamics at the festival, in the context of everyday festival-life. The product is an interactive lamp that encourages a new social practice and not only a novel way of interaction between users and products. At the same time Kommit is a part of a bigger system that raises awareness on sustainability and social responsibility through the festival’s charity cause.' (Mougaard et al. 2008, 6)*

Prototype development
The last part of the project, in which the students developed a detailed plan for the construction, production and marketing of a selected proposal, was not part of the experiment, but demonstrated how the outcome may be the starting point for traditional business and design processes in companies.

The final product proposal is also evidence of the different types of “answers” that are produced when new ontological perspectives are used for framing and addressing modern questions. First, it may be noted that the innovative element of the proposal is the activity, which integrates an innovation in people's behaviour with new light technology. Secondly, the proposal creates value at many different levels. The users will enjoy the experience, other guests will feel more safe and welcome in the camp-site area, the festival will be more popular and have fewer problems to deal with, and humanitarian organisations will have a new channel to spread their message.

The proposal is also a business opportunity for a company to produce the lamps and set up a product service system with rentals, recharging and maintenance of the lamps. Because this proposal creates value at so many

different levels, there are also a number of potential business models which can make it viable.

Discussion

In the experiment, the making of a Practice Map was surprisingly straightforward if one tracks the three elements: image, skill and material. The change of practices is easily explained by the entrance of a new image (e.g., “love and peace” substituted by “carpe diem”), a new skill (e.g., the capability to organise parties) or a new material (e.g., modern communication networks). Similarly, future practices can be envisioned by constructing innovative configurations of these three categories of elements.

The result is not an infinite number of possible practices, but a realistic assortment of what may be, that naturally can extend the past and present.

The practice view has therefore proven that it is a self-contained body of theory that can explain much of the change of everyday activities. Depending on the nature of the theme, and the resources available for the project, it is optional to extend the investigation either into more detailed descriptions of the elements of the actor's practices, or to explore the co-evolution with regimes and product/service systems.

Skills required for approach
The approach requires a skilful innovation team. Like many fuzzy design projects, the team must be able to collect and cultivate large amounts of data through a process that allows insights to emerge. However, for this approach to work, the team must be sensitized to the practical, socio-technical and co-evolutionary world-view, in order to be able to identify, categorize and cultivate the content with good probability.

For engineering design students the approach poses at least two challenges. Firstly, they must understand the change of world-view, and secondly, they have to look into the future. The research cycles have shown that the world-view is all-important in terms of envisioning deep transformation of the everyday; but it also introduces challenges at the same time and is very demanding – even for talented students who are trained in socio-technical thinking. It is therefore recommended to introduce the ontological perspectives over a range of projects first, and only once they have been internalized, start exploring the future.

Conclusion

The research cycle shows that new levels of comprehensiveness, transparency and fluidity can be achieved by introducing a practice-oriented ontological foundation.

The practice theory's conceptualization of activities successfully extracts the most essential information, and the innate understanding of the relationships between elements and change enables a natural cultivation of the content into higher orders of insight.

Practices is the centre piece in the puzzle of perspectives that were introduced in the preceding research cycles. It is both the origin and destination of investigations into adjacent domains by other perspectives, and facilitates a seamless integration of all the insights into the domain of activities. The resulting innovation map is a balanced, representative and flexible overview of the future, which creates clarity and insight into the change and continuity of everyday activities.

The final proposals from the research cycle show that a practice-oriented approach is capable of taking up complex modern challenges and suggesting concrete, well-founded and inspiring innovation opportunities. The outcomes are not user- or product-centric solutions, as in traditional innovation projects, but involve instead the whole context of an activity and create value for a wider audience of people, businesses and society.

The practice-oriented approach is sufficiently practical for use by innovation teams, as it unfolds the domains efficiently for creating visions of everyday activities and exploring future innovation opportunities. However, it is recommended that innovation teams be trained beforehand in seeing the world through different ontological perspectives.

Next

This research cycle concludes the empirical data of the study. In the next part we will analyse the accumulated learnings across all research cycles. Suggestions for further studies are presented in the final conclusion of the study.

THE FINDINGS

The accumulated learning from the four research cycles is presented and discussed in this final part of the thesis. In the first chapter,“Analysis and Learning,” the emphasis is on the creation of an overview of the accumulated knowledge that was built up across all research cycles, as documented in their respective chapters in part three. These insights are then elaborated in relation to the two research questions in the chapter, “Answers.” The chapter concludes with the outline of a new approach and guidelines for how to integrate the approach into the overall basic process. The chapter, “Discussion,” sees the findings in a bigger perspective and prepares the ground for the following evaluation of the practical relevance and academic contribution of the research. Finally, “Conclusion and Perspectives” summarizes the findings, evaluates the research design, and proffers recommendations for further research.

14 ANALYSIS AND LEARNING

The analysis of the research starts with an overview of the evolution of the understanding of the issue and the different types of approaches throughout the four research cycles. Thereafter we look across all of the research cycles and analyse the accumulated learnings.

14.1 OVERVIEW OF RESEARCH

Research cycle 1
The series of research cycles started with the relatively simple suggestion that the process of populating the content should be more inclusive and that visualization techniques could enable teams to handle a more encompassing approach. It was also proposed that the concrete everyday context should be the pivotal point of content generation, so that the most relevant information is given first priority.

The first experiment demonstrated that all initiatives were both feasible and effective. The focus on the everyday improved the relevance of the content, and the inclusive techniques generated very densely populated innovation maps. However, even though it can be said with certainty that the resulting innovation maps in the first experiment were more comprehensive, simply in terms of the amount of information contained in the outcome, it was difficult to assess how exhaustive the vision space was explored. It therefore remained unanswered whether the content provided a representative overview of the future, or if the individual innovation map provided only a small sampling of the possible alternatives.

It was therefore found that the comprehensiveness of the innovation map cannot be fully evaluated unless the structure of the vision space is revealed, or in other words, unless the innovation map is transparent. An elaborate review of the results of the experiment revealed that some students had processed the information of the vision space, and thereby improved the transparency of the outcome. This gave rise to the hypothesis that the key to creating higher quality outcomes is founded in the ability to transform a wealth of information into insights; the better the information is processed and the complexity is collapsed, the better the innovation map can encompass a wider scope and provide insight into the relations across the content and the dynamics over time.

Research cycle 2
In the following two research cycles the main issue was excessive complexity. The challenge was to reveal the underlying structures of the content, and thereby collapse the complexity. For this purpose the approaches introduced a number of techniques for manipulating the content. However, it was also speculated that the ability to collapse complexity depends upon how the content is conceptualized and unfolded. Therefore, in parallel new ways of defining the content were introduced.

The complexity of the content was first interpreted as complexity in time, so research cycle 2 focused on the first part of the project process in which the transformation in time takes place. The approach consisted of a simple method to relate different pieces of information to one another and build chains of effects within the content. Furthermore, it was also believed that

the content had to be further specified, so that the different lines of content would naturally relate to one another. It was found that a number of perspectives from socio-technical studies could provide a relevant and potentially powerful insight into the dynamics of domains related to everyday activities.

The experiment showed that the approach succeeded in laying out a comprehensive overview of relevant and essential elements, but the process of integrating and making sense of the content was not satisfactorily concluded. The conclusion was that the socio-technical perspectives indeed have a great potential to identity factors that shape the everyday, but that the necessary experience and knowledge was not adequately present from either the facilitator or the students at that time, to carry it through.

Research cycle 3
Research cycle 3 interpreted the main issue as “complexity in space” and the new approach sought to process the content of the total vision space across the whole project process. Again the approach was constructed as a combination of techniques for processing the content and obtaining a more detailed definition of the content.

Unfortunately the experiment did not show much progress even though the techniques proved practical. Even when participants in the experiments were given plenty of time, and repeatedly asked to integrate content, there was no significant improvement in the quality of the outcome. In other words, the integration of content and the collapse of complexity proved to be as difficult as mixing water and oil.

Given the experiences with combining techniques for processing and conceptualizing the content, it was obviously necessary to go to a deeper level of theoretical abstraction and reflect upon the source of complexity and our ability to make sense of the content.

From an ontological level of abstraction it is only logical that the perception of the world sets the fundamental premises for which elements the vision project should contain, as well as the concepts, methods and tools that support that world-view. From this level of theoretical abstraction, the problems in the previous research cycles concerning the creation of transparency can be interpreted as a matter of incompatible world-views. More precisely the problem is that the techniques for processing were based on a systemic world-view, while the definition of the content was based on a constructivist world-view. In consequence the techniques could not bring out the potential of the perspectives on the content.

Research cycle 4
In the final research cycle the hypothesis was that the unyielding complexity was caused by mixing incompatible framework elements that were conceptualized with very different world-views in mind, and which had little or no relevance for understanding the dynamics or potential of the everyday. To test the hypothesis that it was the implicitly embedded world-views of the techniques that hampered, rather than advanced, the potential of the perspectives, the fourth and final research cycle developed a coherent ontological foundation and disregarded the previous methods for information processing. Instead it was left to constructivist methods to manipulate the content and facilitate the emergence of insights.

The ontological foundation was expanded to encompass several new perspectives oriented towards a core unit of analysis. The core unit of analysis was 'practices' and formed a well-founded nexus from which all other supporting perspectives could better elucidate the change and continuity of

everyday activities. The experiment showed that the practice-oriented approach makes it possible to achieve new levels of relevant and navigational outcome. The constructivist world-view and compatible techniques were demanding for the students, but also resolutely collapsed the complexity. The resulting innovation map showed a significant improvement in all three desired navigational qualities.

	Research cycle 1	Research cycle 2	Research cycle 3	Research cycle 4
Main issue	Reductionist approach	Complexity of content	Complexity of content	Systemic world-view
Methodological approach	Open and inclusive exploration supported by visualization Focus on everyday domain	Processing content in time. Socio-technical perspective on everyday and context.	Processing content in space with the use of metaphors. Multiple perspective on everyday.	Defining, unfolding and processing content on the basis of a practice-oriented ontological foundation
Innovation map qualities	Comprehensive	Comprehensive, transparent	Comprehensive, transparent	Comprehensive, transparent & fluid

Table 14.1: Overview of the four research cycles.

14.2 FOCUS AND CONTEXT

Focus and unfolding

Throughout the study it was a central challenge to define the content of a vision project. Contrary to popular scenarios and trend-based approaches, this study does not accept the implicit assumption that macro-level factors drive all other aspects of our reality. Rather we focused on innovation opportunities in the context of everyday activities and only investigated neighbouring domains that either have a direct influence or may connect everyday activities with the overall value objectives of a vision project.

The study showed that defining the content is a complex matter. To begin with the study defined the main elements as people and products that take part in a given everyday activity. Each of these was then further elaborated, as for example in terms of people's lifestyles and physical fitness, or in terms of new technologies for products, and changes in production systems. These elaborations then became sub-themes of the investigation. Furthermore the immediate physical and social contexts of the everyday activities were believed to be decisive for understanding changes to them. In this way, the study attempted to develop an understanding of how the whole scene that surrounds everyday activities evolves over time. However, there are many potential factors which influence the scene, such as social relations between people, technological progress, large-scale socio-technical systems, economic resources, etc., so it is undoubtedly a major challenge for vision projects to prioritize and delimit the investigation.

The essence of change

An important aspect of defining the content was to identify one or more units of analysis which could describe the change over time. For example, when we consider the change of people, then the concept of 'needs' may not in itself contain much explanatory power of the long-term change, whereas the concept of 'lifestyle' better encompasses a number of sociological, economical and contextual factors, which combined outline the overall changes that are relevant for envisioning changes in everyday activities.

It is herein assumed that different domains evolve according to different underlying patterns or 'logics'. For example, the linear and progressive evolution of new technology may have little in common with the cyclic changes of fashion.

The overall idea is to explore the change of everyday activities by analysing change within a number of related domains which have developed according to their respective logics. Furthermore it should be taken into account that domains do not evolve independently. Ideally the process also takes into account the ongoing co-evolution that takes place between the different domains.

In popular media the concept of 'lifestyle' is broadly acknowledged and there are prominent trend-gurus who predict changes in lifestyles. Likewise there is a great deal of research going into understanding how technologies will progress in the future. However, if we look beyond these popular domains and investigate other domains that are related to everyday activities, then we find that the nature of change in these domains is rarely discussed and not much research has been dedicated to it either. The conceptualization of the content is therefore not merely a question of unfolding the most relevant domains but also a matter of selecting the domains within which there exist a well-founded understanding of how particular domains evolve over time.

Defining assignment

The total amount of possible domains to investigate is perplexing for an innovation team. Firstly, unfolding of domains is complex because of the many potential domains to investigate and the different ways of conceptualizing those domains. Secondly, we need to understand how these domains evolve both internally and in connection with one another. Finally, it may be relevant to investigate themes beyond the current theme, which either are directly influential or share similarities, so that lessons may be learned from them.

It is therefore important to define the assignment in a way that it delimits and guides the project within an appropriate area of investigation. In this study, we learned that the unfolding is better guided by a triangulation of the assignment which includes a definition of the theme, a description of some perceived dilemma that causes tension, and a statement of mission that should be pursued. In union these three elements support the project process throughout its term and can delimit a reasonable space to investigate.

Comprehensiveness

The infinite web of related domains makes it difficult to assess how comprehensive an innovation map actually is. It is obviously not feasible to know everything about everything. The scope of domains may give a pointer to how comprehensive the outcome is, as it indicates how well-founded the analysis is, and how deeply a given project envisions change. However, it is difficult to assess the comprehensiveness of the outcome simply by looking at the unfolding of domains and the proposed innovation opportunities.

In the third research cycle the intention was to organise scenarios and opportunities by clustering them. Such exercises are useful in terms of organizing the output of creative sessions, but do not give sufficient insight to judge whether the material is a representative overview of the most significant dimensions of the potential innovation space. For this purpose we need a frame of reference which may be provided by analysing the underlying structures. In other words, the comprehensiveness can only be fully evaluated by increasing the 'transparency' of the underlying structures. In

the following section I will review the study with regard to manipulation and processing of the content, which are directly related to the revelation of underlying structures.

14.3 POPULATION AND CULTIVATION

In principle the creation of the vision space concerns two main aspects: the population of domains and the cultivation of the content. Research cycle 1 introduced a radical new way of populating the future by creating 'sense-making' clusters of trends. The technique was very successful in opening up the scenario space and, in consequence, the attention shifted towards subsequent cultivation of the content. The study of the cultivation was aimed at 'collapsing' the complexity through techniques coming from the field of systems theory. For practical reasons the issue was divided into two separate research cycles that focused respectively on the time and space dimensions of complexity.

In order to promote the revelation of underlying structures, the study introduced several exercises, such as creating influence diagrams and concept maps, which served the purpose of manipulating and integrating the content. The process of revealing the underlying structure proved to be a laborious task which involved the collection and manipulation of diverse information. When trying to understand in depth the complexity of everyday activities, one may easily get buried in the details and influencing factors, so it is no wonder that most professionals resort to ready-made trend reports.

The disadvantage of ready-made reports is that they tend to be very general and do not focus on the integrated nature of a concrete everyday context, which makes them unsuitable for vision projects. It is therefore necessary for innovation teams in the context of vision projects to engage themselves in the full project of revealing the underlying structures.

Textbox 14.1: The framework as a machine

In a metaphorical sense the framework can be considered a processing machine that takes in information and produces meaning. If the processing machine does not distinguish between different types of input there are limits to the level of meaning it is able to produce. However, if the machine knows about the structure of the information, and can use this knowledge to assemble the information into meaningful structures, then the output becomes far more valuable. It is therefore important to construct a framework on the basis of reflections at an ontological level of abstraction.

Schemes and metaphors

It was found that different schemes or logics are both practical and useful in revealing the underlying patterns of information. In particular when these logics are represented by a metaphor, it was found that they enable teams to reveal very complex structures and dynamics, which can then be easily communicated both within and outside the team.

The use of schemes is not without complications. In many situations it may be impossible to assign a scheme because the information does not lend itself to any particular explanation. Another problem is that some schemes may over-simplify the complexity of reality. To a certain degree simplifications are inevitable and desirable in the context of vision projects, but they must be negotiated to avoid reductionism and the degradation of the quality of the innovation map.

Even though the above mentioned techniques can provide a greater understanding of the content, it was also found that there are limits to the level of insights that can be achieved. For example, it was seen in research cycle 2 and 3 that no matter how hard it was attempted to create deeper insights with the operative methods, they could not produce underlying insights into the content.

The result was disappointing because the content was conceptualized in ways that were derived through sociological research and were expected to reveal fundamental structures, but the operative techniques did not lead to any significant progress. The problem was found to be rooted in fundamental differences in how substantive concepts and operative techniques conceive reality. For example, when we investigate a domain of social reality, where we assume that several factors engage in a subtle interplay, techniques which assume that reality consists of independent and rational elements do not lead to greater insights.

Visualization
Visualization tools can enhance the capacity to deal with larger amounts of data and were found to be instrumental for the exploration of the innovation space. Nevertheless, an open and inclusive approach to the collection of information can quickly accumulate more data than can possibly be managed by the innovation team. It is therefore crucial to leverage the addition of information with the processing of it. As we process information we may reveal insights which can collapse the complexity of a given mass of information and thereby allow the addition of new information into the project.

All in all, it was concluded that a certain degree of complexity is unavoidable and an essential part of the management of a vision project. Visualization tools and processing techniques may remedy complexity to a certain level, but it should also be recognized that the overall level of complexity is related to the different perspectives on the world that are propagated by framework elements and their ability to capture the nature, dynamics, and change of everyday activities. Further improvements therefore require reflections about the construction of methodology at a deeper level of abstraction.

14.4 ONTOLOGICAL PERSPECTIVES

Figure 14.1: The dynamics of everyday can only be envisioned effectively by considering the underlying perspectives on the world.

The current academic understanding suggests that substantive and operative knowledge are two unrelated aspects (see chapter 7, “Framework Structure”, for further explanation). It is claimed that substantive knowledge only regards 'what is', i.e. the domains and their conceptualization, while operative knowledge concerns 'what may be,' which is closely related to logics of change.

However, the research reveals a deeper dependency between the two bodies of knowledge by showing that operative techniques incorporate rational assumptions about the relations between elements and thereby promote a systems theoretical worldview. The operative techniques therefore cannot be freely projected from one domain of reality to another.

It is also found that substantive knowledge not only defines 'what is' but also ventures into defining the relations between elements and making suggestions for how reality changes. It follows that the knowledge of 'what is' and 'what may be' overlap since both incorporate views on the nature, dynamics, and change of a given area of study.

The findings lead to the conclusion that it is first and foremost the perspective on the nature, dynamics, and change of everyday activities that is

important for the construction of an improved methodological framework.

The key to improving navigational qualities is to be found in how we understand and envision the dynamics of change in everyday activities.

Two fundamental perspective

In the context of vision projects it is particularly relevant to distinguish between a rational, systems theoretical perspective that assumes that elements contain certain properties and behave accordingly, or a constructive sociological perspective which seeks to interpret and make sense of complex social contexts.

The operative theory is based on formal theory which also encompasses mathematics, operational research and systems theory. This is a highly rational body of theory which uses logic to analyse the world. Basically, it assumes that the world consists of elements with certain properties and that these interact in a rational manner. On this basis it is straightforward to logically derive consequences and alternative situations. The trend-approach is largely inspired by the same world-view. However, the formal theory does not capture the essence of social reality, which cannot simply be conceptualized as rational elements.

> *"What we win on speed, we then often lose on relevance of our models. Much ordinary everyday behaviour, and commercial and entrepreneurial behaviour, comes under this category." (Roozenburg & Eekels 1995, p.67)*

On the other hand there is the social theory, which is mainly substantive and better captures the essence of social realities such as everyday activities, but is not always practical and seldom gives concrete guidelines for exploring how reality could be. Social theory may therefore be more demanding for a project team.

Textbox 14.2: Ontology foundation, worldview, and perspective

In this study the term 'perspective' is widely used as an alternative to more academic terms. A perspective is, like a worldview, a way to view the world, but it is first and foremost a way of conceptualizing the world which is useful in practice. We thereby try to avoid abstract theoretical discussion and take a pragmatic approach in which different worldviews are judged according to what they may offer in relation to the concrete context of application. In the context of vision projects it is useful to use and negotiate several perspectives which, in combination, can constitute an ontological foundation.

Negotiating perspectives

Different world-views have varying capabilities to describe a particular domain of reality and it is found that a constructivist worldview is superior in understanding the dynamics of everyday activities, compared to the systemic world-view which is often the implicit foundation of tools and techniques. The disadvantage is that constructivist approaches require greater analytical skills and resources. The challenge of modelling a new methodology therefore starts with the definition of an ontological foundation which incorporates constructivist perspectives on everyday activities and yet is also suitable for the setting of vision projects. Whenever this theory is not developed or practically applicable we must add operative theory to obtain a sufficient working framework for envisioning alternative everyday activities.

15 ANSWERS

In the previous chapter the main insights from the research were presented. In the following we will see what kinds of answers those insights provide to the research questions posed in chapter 1, “Introduction”.

15.1 RESEARCH QUESTION 1

RQ1: What is the issue which causes an unsatisfactory innovation map and which type of methodological approach can most significantly improve the quality of an innovation map?

The learning process of the research may be described as a gradual unpeeling of the relationship between a methodological framework and the qualities of the resulting innovation map. The series of research cycles gradually builds up an understanding of the issues involved in creating navigational innovation maps and provides both practical and conceptual insights into the construction of an improved framework. The insights lead to an understanding of the potential for improvement of innovation maps by means of different types of methodological approaches.

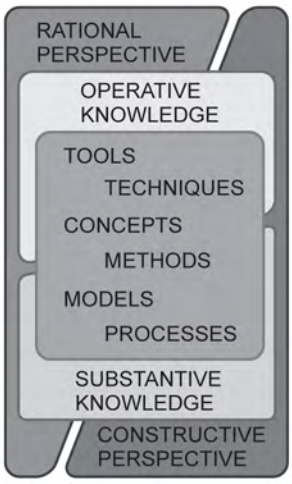

Figure 15.1: The three levels of abstraction.

In total the research considers three levels of abstraction of a framework. The first and popular understanding is that a framework consists of different elements such as methods, techniques and tools which in principle can be mixed and used for all kinds of purposes. This corresponds closely to the idea of methodology as a toolbox.

The second level of abstraction suggests that a framework is composed of two types of knowledge that either define 'what is' or 'what may be', so that the focusing and unfolding of reality are separated from how change is envisioned. These aspects are designated respectively 'substantive' and 'operative' knowledge. The distinction is important because many of the methods and techniques used for vision projects build on inappropriate assumptions about reality, but also incorporate interesting and very useful methods for analysing change. By separating the two aspects, it is possible to modify the framework elements so they are suitable for vision projects. For example, this study challenges the traditional, trend-based approach assumption about reality, which assumes that changes to everyday activities are determined by macro-level factors, but it does not rule out the existence of trends within everyday activities.

However, the research shows that substantive and operative knowledge are highly dependent and may counteract each other when analysing everyday activities. This has led to the discovery of a third 'ontological' level of abstraction, claiming operative knowledge is not free of substantive content. Operative knowledge is based on a positivist worldview that may be appropriate for technical aspects, but fails to capture the complexity of social reality. It is therefore important to consider the ontological perspectives in order to construct a purposeful framework. The research does not rule out that the innovation map can be improved within the mindset of all three levels of abstraction, but it is found in this study that the potential for significantly improving innovation maps, across all three desired qualities, increases as we advance towards the deeper levels of the framework structure.

The lack of navigational outcome is therefore mainly found to be caused by the mixing of framework elements, which propagates incompatible perspectives on reality. In practice the issue hinders the development of insights about the dynamics of everyday activities, which are essential to overcoming the immediate complexity of reality and providing a comprehensive, transparent and fluid outcome. The construction of a new approach should therefore, first and foremost, be based on an ontological foundation which illuminates the potential of different perspectives within various domains and gives direction for how to negotiate these perspectives in relation to the concrete assignment.

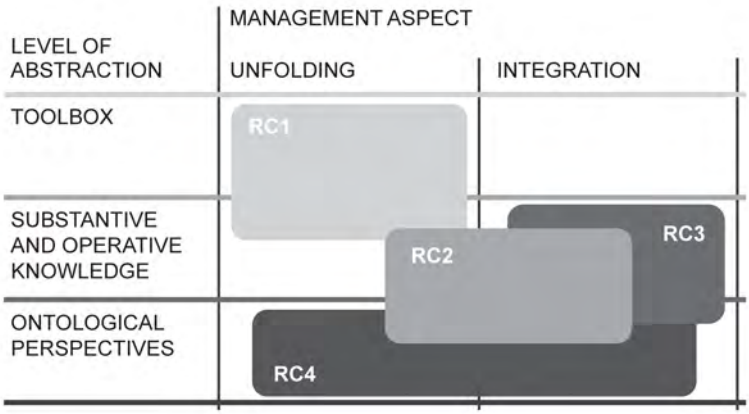

Figure 15.2: The research explore the potential at different levels of framework abstraction as well as management aspects.

Constructing an ontological foundation

The construction of an ontological foundation is a complex matter. The subject matter of vision projects are closely related to a number of domains which can be subject to different perspectives and interpretations. The findings resonate with the critical realist paradigm, which has been assumed in the research and confirms the suitability of a pragmatic and designerly approach. However, it is challenging to construct an ontological foundation which contains a variety of perspectives. It is necessary to build an understanding of how different domains and perspectives are interrelated so that they can be integrated into a coherent and sense-making overview across all divisions.

The research shows that the identification of a relevant ontological perspective is not simply a choice of the perspective that most precisely reflects the nature of a domain. Perspectives may require very diverse resource from the project set-up. A constructivist world-view assumes that elements are interdependent and co-evolving and demands much time to analyse and allow for new concepts and insights to emerge. From a systems theoretical point of view the relations are linear and the type is cause-effect, and can be handled by formal logical methods.

Another factor in the construction of an ontological foundation is the state of evolution of new techniques and tools. Even though a theoretical field is well-founded it is not always applicable in the context of vision projects. Constructivist research traditionally involves an extensive gathering of rich data, which is then subject to a grounded analysis and lengthy cultivation to extract insights. The constructivist approach also requires analytically-skilled team members and the integrated nature of the material makes it difficult to increase productivity by delegating tasks to sub-groups. It is therefore an ever present negotiation of how constructivist the approach can be within the limits of the resources available. Given this background it

is no wonder that the rational perspective has been the popular choice of innovation teams working under tight deadlines. It is therefore only relevant to challenge this dominance when the stakes are higher and the level of insight required rises accordingly.

The key to improving the navigational qualities of the outcome is therefore to construct an ontological foundation based on a constructive perspective on reality to the extent that applicable framework elements exist.

In summary, the answer to the first research question is:

a) Navigational qualities are most significantly improved by developing an ontological foundation which reveals profound insights about the nature, dynamics and change of everyday activities.

b) A constructivist ontological perspective on a particular domain allows for a deeper understanding, but also requires more resources than the dominant rational ontological perspective. In the context of vision projects the use of either constructivist or rational perspectives therefore depends on the availability of applicable constructivist approaches.

c) Everyday activities co-evolve with other domains of investigation, necessitating a multi-domain approach.

15.2 RESEARCH QUESTION 2

RQ2: How can a new methodological approach for vision projects be constructed and integrated into an overall framework so that it is applicable within the project context?

The first research question argues that a multi-domain and, preferably, constructive-perspective ontological foundation should be the starting point for the construction of a methodological framework. The search for a relevant constructivist body of theory which is applicable in the context of vision projects was a strenuous task. There is a large body of theory which focuses on the everyday, but it either does not consider the dynamics of the everyday or disregards the role of material artefacts. It was only after several attempts that a suitable field of constructivist knowledge was discovered.

It turned out that in recent years a small group of researchers from the field of sociology has sought to construct practical and multi-domain investigations of the everyday, society and technology (Bijker 1995; Shove 2003; Elzen 2001; Geels 2005; Spaargaren 2003; Schot & Geels 2007; Oudshoorn & Pinch 2003). These researchers analyse different domains, but use the same constructive perspective to make sense of reality. Their basic procedure is to define a number of factors which constitute a configuration which bridges the socio-technical divide within the domain. The configuration may form a stable equilibrium for a period, but if tension grows or an external impulse exceeds a certain threshold, the configuration breaks up. After a while a new stable configuration emerges as a result of a complex negotiation of the individual elements.

The research combines practice theory with socio-technical studies and is promoted in the design community as the 'practice-oriented product design' (POPD) approach. The approach constitutes a coherent ontological foundation which can competently account for the complex interplay between everyday activities, objects and people. The most important feature may in fact be that practice theory is a practical and pragmatic approach, which enables a smooth integration of different perspectives relevant for the everyday domain. Schatzki (1996) praises practice theory for neither being

individualist nor holistic. Rather, practice theory “presents pluralistic and flexible pictures of the constitution of social life” and “successfully accommodates complexities, differences and particularities” (Schatzki 1996, p.12).

Shove's (2003) account of washing practices is an excellent example of how a practice-oriented approach can unify different perspectives in order to understand the evolution of a theme over time. The mix of historical accounts and theories from sociology and science of technology weave into one another and give a comprehensive and well-founded insight into the underlying factors that shape the washing practice. Unfortunately, Shove does not endeavour to construct an explicit meta-theoretical foundation. Yet it is possible to aggregate and generalize a number of analytical inquiries from her account of bathing practices, plus other historical accounts of changing everyday practices, that can potentially add to the explanation of the dynamics of everyday practices.

Analogously designer researchers in the field of user-oriented design are collaborating with ethnographers and integrating constructivist perspectives into the design process (Stappers & Visser 2005; Visser 2009; Sanders 2002). Their research shows that it is possible to obtain a profound understanding of people's everyday lives with few resources, and may inspire the further application of POPD in the context of design and innovation.

The potential of a practice-oriented approach
In the fourth and final research cycle the practice-oriented approach proved to be a valid alternative candidate to the rational, trend-based approach. First and foremost the concepts and models of practice theory provide a deeper insight into the dynamics and change of everyday activities in a way that is applicable within the context of vision projects. Secondly, it is found that the concept of practices is a unit of analysis that can bring together a number of domains and new perspectives into a coherent whole. Practices are therefore the natural nexus for the multi-domain approach that has been constructed and is therefore called a “practice-oriented” approach. The qualities of the practice-oriented approach are elaborated below:

Performance qualities:

- **Explain everyday activities in-depth**
  The approach captures the subtle interplay between a number of factors which are immediately relevant and decisive for the performance of everyday activities. It is the best possible foundation for obtaining profound insight into the change of everyday activities.
- **Captures the change and continuity of everyday activities**
  The approach is an equilibrated view of various factors that cause change and continuity in everyday activities. There are many factors and random events that influence the future of the everyday, but practices cuts through the noise. It contains practical logics for making sense of information and several domains have detailed models for change. Furthermore it is easily extended to include the social structures, system of provision and product-service system that surround everyday activities.
- **Practical and solution-oriented**
  The approach defines a practical set of concepts that can be immediately investigated by designerly methods, and the approach explicitly takes into account the material-technical-functional properties, know-how and understandings of products, which are particularly relevant in the field of design and innovation.

Multi-domain qualities:

_ **Point of convergence**
Insights are brought together into a coherent understanding by defining a core analytical unit which other perspectives converge towards.

_ **Relevant and emergent unfolding**
The concept of 'practices' is a natural starting point for unfolding the immediate context of everyday activities. It is easily extended to incorporate other inspiring perspectives so that the united ontological foundation conceptualizes a space which is both expansive and interconnected. Depth and direction of analysis can be adjusted according to the ongoing unfolding.

_ **Emergent perspective**
Even though the practice-oriented approach is biased towards constructivist perspectives, it can be combined with other perspectives, such as the rationalist systems theoretical perspective. It is fundamentally pragmatic and allows the same material to be analysed from different perspectives, so that the best determinant perspective can be found in the process. For example the approach acknowledges that there are rational, cultural and social interpretations of the motivation for performing everyday activities.

In summary the answer to the second research question is:

a) Recent research has developed a new 'practice-oriented' body of theory that makes it feasible to incorporate constructivist perspectives into the methodology for vision projects.

b) The practice-oriented approach captures competently the change of everyday activities and can function as a nexus for integrating other perspectives.

The answers to the second research question are further elaborated in the remainder of the chapter where we will outline a modified version of the practice-oriented approach for vision projects and show how it can be integrated into a framework.

15.3 OUTLINE OF APPROACH

The practice-oriented approach builds on a number of different perspectives which are being explored in the field of constructivist thinking and socio-technical studies. It is a particular configuration of perspectives with the purpose of understanding the nature, dynamics and change of everyday activities. It builds a tailor-made foundation *“by pulling threads of different disciplinary approaches together in new combinations”* and filling *“the gaps and cracks that lie between the tracks of disciplinary development in sociology, science and technology studies, design research and studies of material culture.”* (Shove et al. 2007, p.10). The approach is therefore firmly grounded in constructivist thinking, but also applies a pragmatic attitude to the integration of different domains and perspectives in pursuit of a practical goal.

The body of practice-oriented research mentioned above has recently been applied in the context of design and innovation, but these projects aim at traditional product design and do not endeavour to explore and map radical innovation opportunities. This study has therefore adapted and extended the practice-oriented approach to suit the overall goal and context of vision projects.

The nature of everyday activities

The starting point for the construction of an ontological foundation is to reflect upon the nature of the everyday. The prevailing behavioural-rational view in design and innovation assumes that people are independent, free and logical individuals. However, if everybody was constantly thinking rationally about their next action it would require a lot of effort. Alternatively, one could suggest that people act more or less spontaneously and creatively according to the concrete social situation, concrete context or emotional mood with no prior plan (Suchman 1987; Suri 2005). This view may account for the overwhelming variety of everyday activities and provide in-depth understanding of specific observations, but it does not describe the underlying factors that cause the repetitive structures of the everyday.

Whether people like it or not, they have to get up in the morning, commute, work, pick up kids, cook, watch TV and sleep. These patterns of activities are repeated daily for most people, without any renewed reflection on the reasons behind them. These are so-called shared practices which take up the bulk of everyday activities and have a decisive effect on the challenges of modern society.

In this study it has been central to understand which factors determine practices and how they change. The everyday is considered by design practitioners to be a kind of 'sticky glue', because it seems to be one integrated mass, rather than a collection of individual elements. In the quest to understand what this mass consists of, this research has been inspired by:

_ Socio-technical studies:
The understanding of how objects and users are configured and constructed.

_ Material culture:
The inertia and incentive that lies within specific material and bodily existence configurations.

_ Situated action and context mapping:
How activities are shaped by the immediate environment and the capabilities of the user.

_ Cultural studies:
How shared beliefs determine practices.

Basic elements

It was found that all of these aspects are best summed up by the definition of three basic elements that constitute a practice: material, image and skill (Pantzar & Shove 2006)

_ **Material**, by which we mean technologies and tangible, physical artefacts;

_ **Image**; including the domain of symbolic meanings, ideas and aspirations.

_ **Skill**; which encompasses competence, know-how and technique.

The definition encompasses the extremes between the abstract mental images, the concrete material technologies and the more subtle latent skills. It serves as a balanced view of the most decisive factors in the constitution of everyday practices.

The definition of the three elements can be further elaborated to accommodate additional perspectives, e.g. mental images can be socially, culturally or individually embedded in people or inscribed in products by design-

ers. Skills may comprise the learned capabilities of people or the technological functionalities of products. Material can be understood as the consumption of resources or the form and mass of products and bodies.

Figure 15.3: The basic elements of everyday practices.

Figure 15.4: Actors are carriers of basic elements.

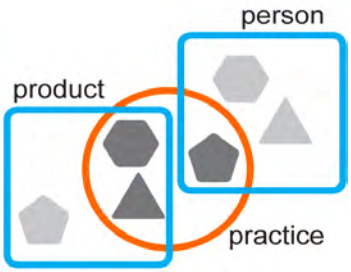

Figure 15.5: Actors contain the basic elements necessary for the performance of practices.

By applying interpretations of the main elements of a practice flexibly, we achieve a dichotomy of basic elements which can serve as a multi-perspective analytical framework for the vision project. It has decisive practical implications because it saves the innovation team having to collect and filter specific information for each perspective that is applied. Herein it allows the most decisive perspective to emerge from the content as it is being developed and may allow for an early identification of key aspects.

The elaborated definition is applicable to analyses of both people and products, and ties the two closely together in the performance of practices. In this view, the performance of a practice accommodates and requires a certain configuration of image, skill and material, which a mix of different actors – people or products – may collectively bring on to the scene. If we switch focus from the practice to the actors, we may note that certain actors participate in many practices and are carriers of a variety of images, skills and materials which can be put to use when needed by different practices.

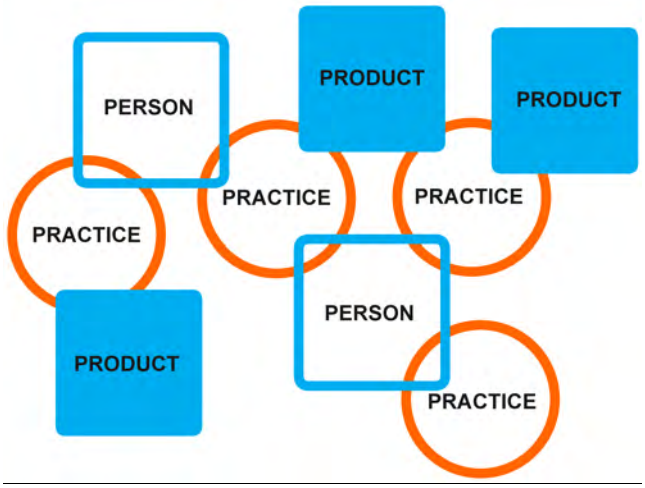

Figure 15.6: A seamless web of practices and actors.

However, the actor does not indiscriminately contain any kind of element. A person may have his own belief systems, level of education, motor proficiency, etc. which limits the embedded elements and thereby the amount of practices that the person can participate in. A person has a logic to his own being, which is often discussed as a concept of “lifestyle”. Similarly, a product may belong to a certain product type which outlines the basic elements it contain.

The introduction of a logic of the actor which complements the logic of a practice is, in a sense, a return to the individualistic rational view of products and people as entities with inherent needs and functionalities. But

because it is balanced by a constructivist view on practices, it only strengthens the overall multi-perspective ontological framework further by allowing both rational and constructivist forms of interpretation.

The overall model assumes that everyday activities are linked through a seamless web of people and products. The basic elements are pervasive throughout the web and constantly negotiated with the internal logics of the practices and actors.

The model balances the logic of a practice with the logic of actors, and yet builds on the same fundamental elements. It enables uniform collection of information and a seamless unfolding of the web of practices and actors that surround any given theme.

Unfolding the immediate context

The understanding of the everyday as a seamless web of practices and actors implies that any practice or actor cannot be understood in isolation. It is therefore necessary to unfold the immediate context to understand the dependencies and limitations which surround the field of investigation. The web may be unfolded in a number of ways:

- **By practice**: list all the actors that engage in a give practice.
- **By actor**: list all the practices that a given actor is involved in.
- **In time**: follow a person for a day and record the practices.
- **In space**: record all the actors in a given location and elaborate the practices that they may support.

Each of these unfoldings has its own logic and uncovers part of the reason for the overall, negotiated state of the seamless web of practices and actors. For all of the above unfoldings, the basic elements are what tie practices and products together. It is therefore important in the process to specify the images, skills and material of both the practices and the actors relevant to the given context.

The structure of the unfolding ensures an overview of the immediate context, which can be elaborated to the point that it seems relevant according to the particular assignment of a vision project. The idea is that the overview will yield some insights into which aspects are critical for the state of the particular theme and inspire more focused investigations.

Shove (2003, p.134) provides an example of how washing practices may be explored by asking five questions:

- What are the tools of laundering?
- When to launder?
- What is there to launder?
- Why launder?
- How is laundry done?

Each question can be understood from a number of perspectives. For example, the tools of laundering are investigated by observing the actors engaged in the washing practice, while when to launder can be understood through the unfolding of a person or family's daily, weekly or monthly activities. Other questions relate to basic elements such as the image of clean clothing, or the skills and know-how needed for the performance of the practice.

The idea that practices and actors are connected in a vast web implies in principle that a very expansive analysis is necessary to understand any field

of investigation. However, because vision projects only seek approximate knowledge, in practice it is straightforward to delimit a relevant scope for investigation.

Complexity is further compressed by the understanding that practices integrate actors and vice versa, so that sense-making clusters of practices and actors can be identified.

Identifying key issues

It is also possible to do more specific investigations which focus on a few of the basic elements or entities of the overall web. It can be an offshoot of the above unfolding or a key issue that is defined beforehand in the assignment for the project.

The definitions of the basic elements are inspired by the core perspectives from practice theory and socio-technical studies and enable inquiries into key issues which are already well described within these fields.

These may include issues such as:

_ **Product ecologies**
How products complement and compete with one another. Also known as the Diderot effect (Pantzar & Sundell-Nieminen 2003).

_ **Domestication**
How the meaning of objects changes over time and finds its place in the household (Pantzar 1997).

_ **Interpretative flexibility**
How objects are understood differently by groups of users.

_ **Technological frame**
How the meaning of technology is constructed by social groups (Bijker 1995).

_ **Inscriptions**
How designers inscribe intended ways – or understandings – of using a product (Ingram et al. 2007).

_ **De-skilling**
How the products become more advanced and require less skill to operate (Shove et al. 2007).

These inquiries knit together different perspectives and domains, and offer levels of explanation that collapse complexity and empower innovation teams to deal with the more subtle aspects of everyday activities. The ability to track issues, discourses and dilemmas makes the approach effective for pursuing a number of modern challenges, e.g. promoting “engaging” activities that improve people's quality of life.

Extensions

One of the objectives of this research was to re-focus the content from macro-factors to the immediate context of the everyday, so that the everyday is not viewed as determined by external factors, but is understood through its own internal relations and dynamics. However, it does not imply that everyday activities take place in a vacuum. They are embedded in a political, economical, social, technological, environmental and demographic context which both shapes and is being shaped by the everyday. A full analysis of all these aspects is too demanding for a vision project, but on the basis of a concrete theme, it may be possible to delimit the scope of an investigation

of the external factors to a reasonable size, thereby further strengthening the quality of the innovation map.

Another issue is to find a practical and powerful theoretical foundation for understanding the relationship between the external factors and the everyday. In this research it was found that two areas of theory in particular are applicable in vision projects and represent a fundamental extension of the understanding of everyday practices, which is important to understanding the dynamics over time. Furthermore, the extensions are potential areas of intervention that can be used by stakeholders to shape everyday practices, depending on the level of intervention assumed by those stakeholders.

Socio-technical regime

The first extension that was introduced in the research cycles was the concept of a socio-technical regime (Geels 2005), which assumes that everyday practice – or more specifically "user practices" – is part of a larger configuration of a socio-technical regime. The regime encompasses culture, policy, knowledge, infrastructure and technology within a specific sector of society or markets, so that the regime is directly relevant to the understanding of a particular area of everyday practices.

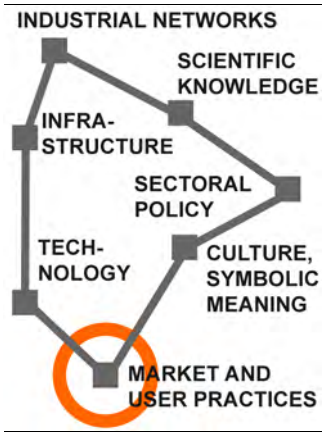

Figure 15.7: Practices are one of the elements of a socio-technical regime (Geels 2005).

Similarly to the definition of practices, the regimes are defined by configurations of elements that may enter a stable state – ergo, a regime – but which also are constantly subject to internal and external impulses that may disrupt the negotiated equilibrium and lead to a phase of renewal.

Product-service systems

In the final research cycle, everyday practices were also seen as part of a product-service system which connects everyday practices with the business and production realm.

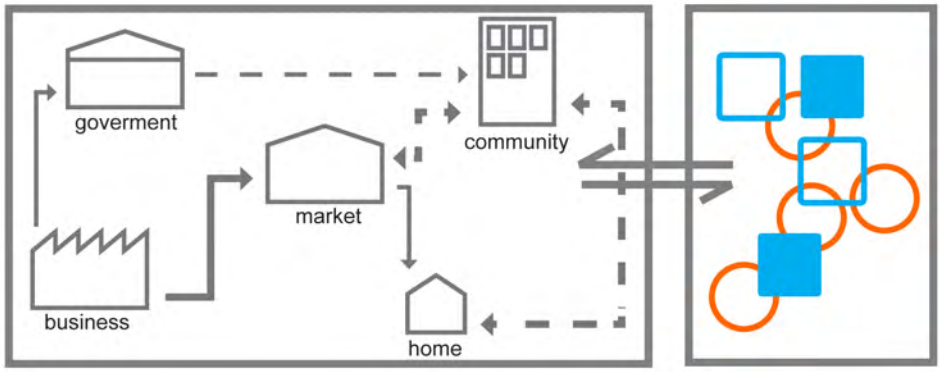

Figure 15.8: Everyday activities is an essential part of product/service systems.

This view assumes that products and services are part of a more comprehensive offering which aims to enable and support an activity. It specifies which material and immaterial flows are exchanged between the agents of the system and thereby brings to the foreground the practical relations between the agents which determine the access and availability of services and products in the everyday context.

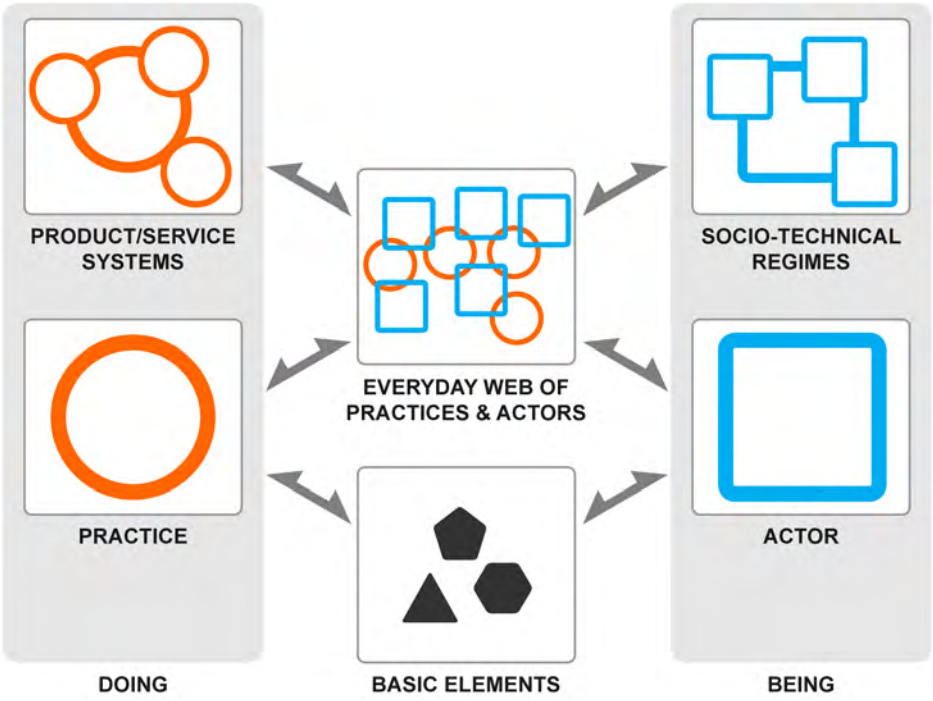

Figure 15.9: Overview of the most relevant domains in the practice-oriented approach.

Change and continuity

The objective of a vision project is to understand how everyday activities may evolve in the future. It must therefore somehow make sense of the interactions and constant negotiations that takes place within and across all the domains described. At the present stage of the practice-oriented approach no such framework has been constructed, and it is questionable whether it is possible to construct one because of the multi-faceted nature of everyday activities. However, within selected domains there are models that suggest specific dynamics, so together they may provide an approximate overview that satisfies the requirements of a vision project.

Most important is the understanding of the dynamics of practices. The constant reproduction of practices can be interpreted as a whirlpool in which each whorl is a practice and the actors flow between them.

The configurations of basic elements is a concrete and practical way of understanding the repetitive activities that takes place in everyday life. The analysis of individual elements offers furthermore another level of analysis which can further deepen the understanding of the diffusion, competition and integration of the everyday practices.

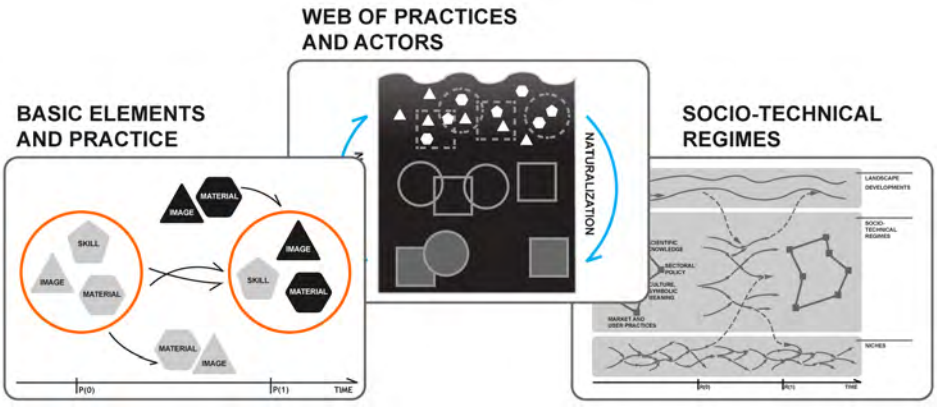

Figure 15.10: Examples of constructive perspectives on the change in different domains.

For example, Shove (2003, p.197) identifies three models of pathways for washing practices: a ratchet, a pin-wheel and a spiral. In research cycles 1 and 3 it was shown that cognitive models could collapse complexity. These simple cognitive models are a first steptowards associating specific cognitive models to certain perspectives.

Within the domain of socio-technical regimes four types of transition paths have been identified which depend on the main actors and their interactions (Geels & Schot 2007). The transitions are categorised as either hyperturbulant, specific shock, disruptive or avalanche.

These efforts, along with the fields of study mentioned in the previous section, “Identifying key issues,” constitute an incomplete, but insightful, foundation for identifying the essential factors that shape everyday activities within a given theme.

15.4 TOWARDS A FRAMEWORK

The basic process that describes the overall process of a vision project – and has been used in all experiments – remains the same (see chapter 8, “Contemporary Methodology”). However, the practice-oriented approach has a pervasive effect on the domains and perspectives being investigated within this process. In this section we will analyse the general implications for the structure of the content and thereafter provide some recommendations for managing the content space. For a more detailed account of the application of the practice-oriented approach, “Research Cycle 4,” in chapter 13, will serve as an example.

Structure of content

Figure 15.11: Overview of domains.

A given from the beginning of the study has been that the core domain of vision projects is everyday activities, and that the basic process seeks to explore and map alternative activities and corresponding radical innovation opportunities by means of interpretation and visioning. The central outcome is an overview which connects the past and present with possible and desirable future alternatives.

One of the key contributions of the practice-oriented approach is that it defines in detail what everyday activities consist of and the domains most closely related. Without this prioritization it is difficult to orient oneself in the real world, because social reality is a complex web where many aspects potentially influence any given event.

To begin with, everyday activities are conceptualized as practices, and we are interested in the recurrent events shared by many people, as opposed to singular events. Practices are defined as a configuration of three elements: image, skill and material. These elements are held together by the practice, but they are also influenced by other practices and actors. Because these elements follow, to a certain extent, their own development trajectory, it is relevant to determine how the elements evolve in parallel to the practices. Similarly, we can derive from the co-evolving relation between practices and their immediate contexts that it is relevant to explore and map the trajectories of actors, product-service-systems and socio-technical regimes.

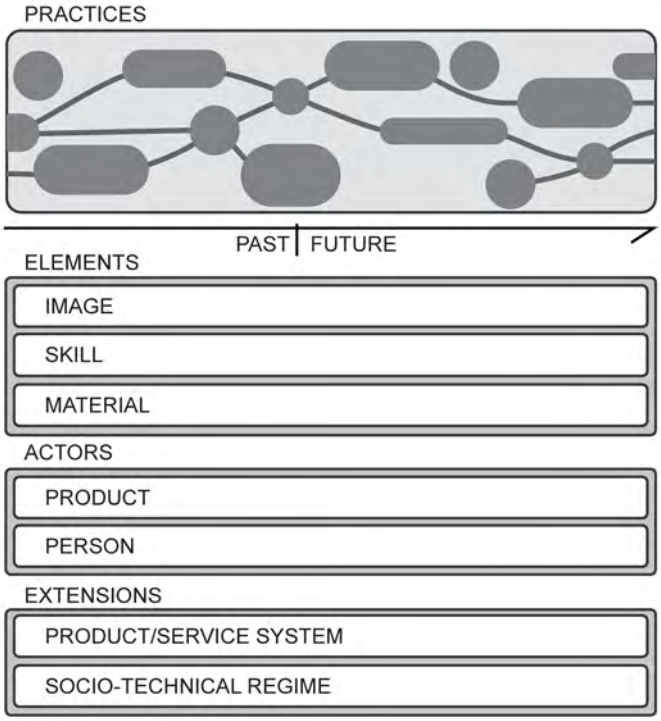

Figure 15.12: Overview of the domains in the manifest layer most relevant to unfolding in parallel with the overview of practices.

Impact across the process

The process of interpretation and visioning, which is part of the basic process, is deeply affected by the practice-oriented approach. Up to this point we have described the central layer of information in the content space. This is the 'manifest' layer which contains the factual knowledge within different domains, e.g., practices, elements of practice, actors and extensions. Each of the domains evolves according to logics particular to the domain. These logics can be determined by both constructive and rational perspectives, depending on the relevance of the perspectives and the resources available. However, since we are interested in how practices co-evolve with the other domains, we also need to interpret the dynamics which take place across the domains. Similarly, the process of visioning must be divided into a layer of visioning within the domains, as well as another level of visioning that looks across all domains.

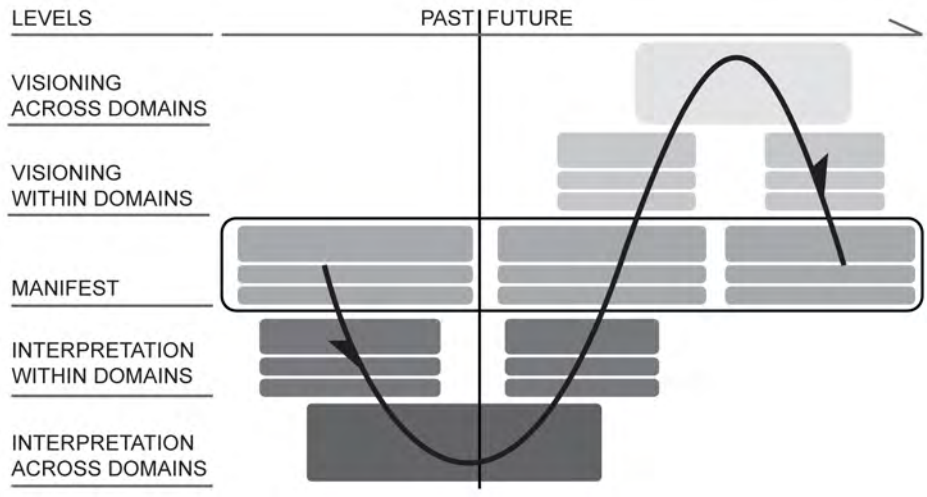

Figure 15.13: The manifest layer in the middle with the interpretations below and values above. The curved line indicates the basic process.

The process

The process consists of phases with analytical interpretation and a value-oriented visioning, but because the content is radically redefined, each

phase is made up of specific tasks that aim to unfold, populate and integrate the different domains in accordance with underlying perspectives. The process below shows how the basic process and the practice-oriented approach can be integrated into an applicable framework. The elaborated version is similar to the process used in the final research cycle (see chapter 13, “Research Cycle 4”). The main phases are:

1. Definition of assignment
2. Unfolding and population of the present
3. Interpretation of change
4. Value-based visioning of concepts

The phases of the process can be executed in parallel and will most probably provoke a number of iterations, but for the sake of clarity the process is presented as a simple list of tasks.

Definition of assignment

Sense the intent and identify key issues. The assignment should elaborate the brief and define guidelines to frame the project process.

The original brief is not necessarily a well-structured outline of a project, so the innovation team must first define the assignment in a way that will take them successfully through the process. From the brief, the team can extract information about the problems, potentials, goals, theme, values and issues that motivate the project. Further investigations may be necessary to elaborate these factors and identify a number of anchor-points and key issues that can guide the project process.

The aim is to make the definition neither too open nor too closed. Otherwise the project will be too all-encompassing, making it impossible to go into depth, or so narrow that the outcome has very limited value.

In case the theme is not described as a practice, it is important to transform it into the domain of practices in order to benefit from the approach. For example, if the brief is to investigate vacuum-cleaners, it might be transformed into the practice of “cleaning”.

The scope of the project can also be delimited by creating an overview of situations or activities that bear resemblance to the theme and might be used as references for interpretation or inspiration.

Unfolding and population of the present

Unfold an overview of the practices and actors relevant to the theme and populate it with concrete information.

Practices and actors are closely interwoven; to disentangle the web, a number of “threads” must be unravelled:

1. Identify the relevant ecosystem of practices and their complexities.
2. Identify the actors engaged in the ecosystem of practices.
3. Identify images, skills and materials across practices and actors.

These threads are not only chosen to document the state of the present, but to prepare the ground for applying different perspectives and interpretations.

Interpretation of change

Track selected key issues and domains back in time. Interpret the changes and extrapolate into the near future.

In this phase, one should look twice as far back in time as one hopes to look ahead. Record the trajectories for each individual domain and key issue.

1. Investigate how elements of practices and ecologies of practices have changed in the past.
2. Track products and people over time and study how their meaning and identity change over time across generations of products and social groups.
3. Identify emerging ideas that are making their way into practices and actors by analysing other themes that bear resemblance to the theme in question.
4. Identify structures and regimes that govern the ecosystem of practices and emerging ideas. List laws, regulations, incentives and subsidies.

Finally, evaluate past trajectories and identify underlying dynamics as well as key events and barriers. Extrapolate past dynamics and creatively envision probable, possible and imaginable futures within each domain and key issue.

Value-based visioning of concepts

Merge insights, evaluate values and develop concepts

The results of the previous steps should provide insight into the patterns of change within individual areas of investigation. Subsequently, these insights can be merged into a collective understanding of how all the different perspectives in union shape the theme in the future. If the assignment aims at achieving a value-based transformation, then this is the time to emphasize those values and explore them in depth.

1. Conceptualize future practices within the theme.
2. Evaluate the practices and determine the values that they represent.
3. Identify the desired values of the vision project, if it was not already done as part of defining the assignment, and compare with the evaluated values.
4. Express the desired values within different domains. Seek inspiration in related themes.
5. Envision future desirable practices and describe product concepts.

Recommendations and guidelines

Even though the number of domains which constitute the core structure of the content space is fairly limited, each domain and its interpretation can easily amount to a very complex and rich content space. It is therefore crucial to negotiate the depth and width of the content space so that only the most relevant information is included without compromising the overall quality. The overview of domains is therefore, first and foremost, a prioritized overview of potentially relevant domains which may act as a point of reference for the actual unfolding. The following section provides a few general recommendations for managing the content space.

Framing

Managing the content starts with framing the assignment. Framing describes the questions being asked and may herein also specify the kinds of answers that are to besought. The research shows that it is optimal to define the questions narrowly, i.e., use “commuting on biking” and not the more general “commuting” as the pivotal activity of a project. The reason is that one of the biggest challenges is managing the unfolding of the content. If the concrete context is too all-encompassing, there will be too many leads to follow, resulting in a content space that is much too complex and resource consuming.

The activity is only one of several possible parameters which can be used to delimit and guide the project. For example, it may be possible to describe the values that should be promoted or some key dilemma that the vision project should enlighten. Certain values may point toward specific key issues which may in turn point towards unfolding specific domains and perspectives. In summary, the following three parameters are essential for framing the assignment:

1. **Activity**
   Which realm of everyday activities is being investigated?
2. **Tensions**
   Is there a problem, dilemma or potential that motivates the investigation of the activity?
3. **Mission**
   Which values should the innovations promote?

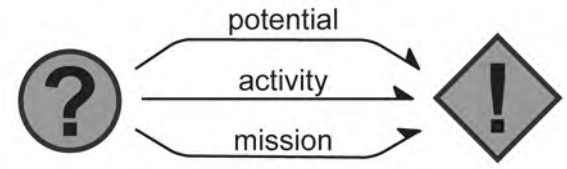

Figure 15.14: Triangulation of the assignment is all-important for the management of the content space.

The tensions and missions will typically relate to modern challenges and transcend the study of relatively narrow activities. These key issues define the overall investigation of the innovation space and should be unfolded individually to provide the best possible guidance for exploring and mapping everyday activities.

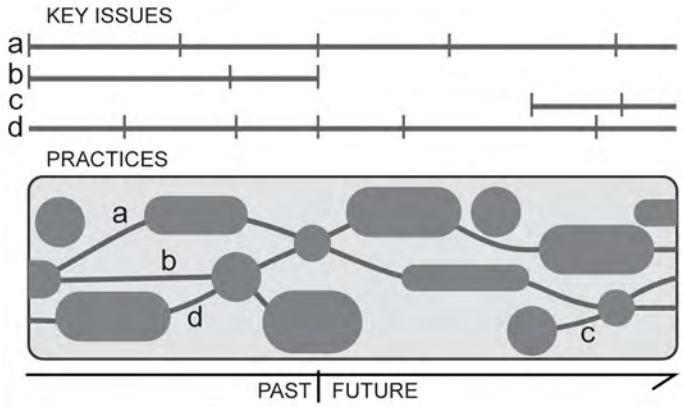

Figure 15.15: Key issues guide the unfolding of the manifest layer.

Furthermore, it is important to clarify the assumed level of intervention and eventually pin-point which aspects of the unfolding should be explored cre-

atively and intensively. Domains outside the object of intervention are explored mainly for the most probable future states and to a much lesser extent.

Emergent process
If all the relevant domains of a given assignment are unfolded according to a pre-determined scheme it is likely that it will generate too much complexity to be handled. It is therefore useful to start with an initial mapping of actors and flows to identify the most relevant domains for the assignment. The domains and aspects identified as key can then serve as the starting point for a gradual unfolding which takes shape according to insights generated during the process.

There is a natural limit to the amount of complexity that can be encompassed by a vision project, so the unfolding may only continue as long as it is possible to collapse complexity in parallel. This is similar to the “Tetris” game in which small squares fall into a container and are terminated by forming patterns. If patterns are not created, the container will quickly fill up and block further squares from entering. Hence, the container is a parallel to the innovation team's capability to comprehend complexity.

The approach implies that the main challenge for the innovation team and, in particular, the innovation manager, is managing the perspectives, unfolding and extensions. Herein, it is essential to direct the content space in the most relevant direction and, at the same time, integrate and make sense of the content to create a well-founded and navigational innovation map.

Snapshots
The constantly co-evolving nature of the everyday is much too comprehensive to be communicated and apprehended. The purpose is to provide an overall understanding, but also concrete insight of particular situations so that it is possible to experience the future oneself. A solution is to create a number of snapshots throughout all epochs and link them with trajectories or key issues. This enables stakeholders to relate with empathy to the specific context in all its complexity, while giving an overview in time.

Rich visualizations
The study provides some insight into possible formats of the innovation map. Rich images have been indispensable for the collection, manipulation and representation of the vision space. In research cycles 1 and 3, all the information was integrated into a single poster. But even though that was a practical format to communicate the main content, it came at the expense of the transparency and fluidity of the vision space.

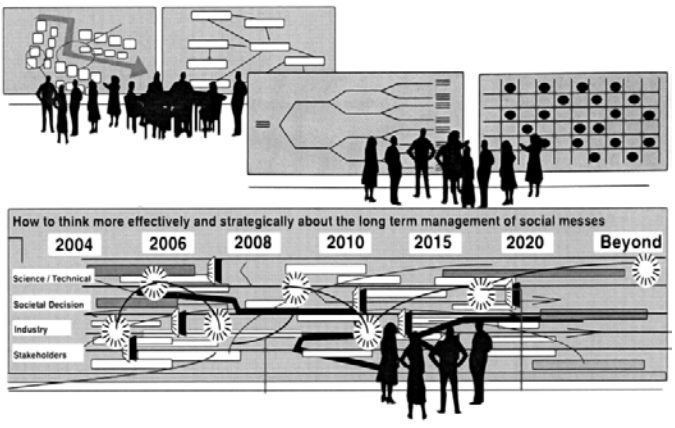

Figure 15.16: Example of interrelated visualizations. Artwork adapted from (Horn 2004).

Research cycle 4 exemplifies a different approach in which the end result is a multitude of interrelated visualizations created throughout the process. In

this way the richness of the vision space can be maintained and is not forced into a single, fixed interpretation. This format is also preferable if the innovation map is an ongoing knowledge base that is frequently updated and discussed. A poster-sized version can then be used for specific purposes, e.g. at formal, stakeholder meetings.

The format of the innovation map

Traditionally, the outcome of foresight is organised chronologically and conveys the impression of constant progress. This is often also the case with technical innovation, but in regard to social innovation the trajectory is far more complicated. The ontological foundation of the practice-oriented approach integrates social innovation with technical innovation and makes it difficult to say anything general about the direction of future practices. For example, new activities can be constructed simply by reconfiguring existing technologies, so social innovation is not necessarily accompanied by technical innovation. In principle, the direction of social innovation is open-ended and subject to different interpretations depending on the underlying value-system. For example, one may ask: “is it progress to sit more hours in front of the television?” or “is it better to grow your own vegetables than having them delivered frozen?” There is therefore no general advice to give about the direction of the innovation map, but given that it consists of several interrelated maps, it is also an opportunity to mix different formats.

The outcome of vision projects in this study has been conceptualized as an 'innovation map', which implicitly assumes that it is a two-dimensional representation. But as the research evolved, the innovation map was increasingly conceived as encompassing several visualizations developed at different stages of the project, instead of as a single, final map where all the information is integrated. A single map easily becomes impenetrable with too much information, while the compression of information may have a tendency either to reduce diversity or lock the spectrum of possibility.

It is therefore proposed that the innovation map should be conceived as a knowledge base consisting of several (visual) elements. This base may evolve over time, and for specific purposes (meetings, campaigns) focused information can be extracted and presented in a single map.

16 DISCUSSION

In this chapter the findings are evaluated in a broader perspective. Herein it is investigated how the findings contribute to academia and are relevant to professionals.

16.1 THEORETICAL ABSTRACTION

Generalist academic dispositions

The main findings support those researchers who complain that methodology is too general and lacks substance. The truth is that the nature of the content is rarely discussed in traditional business, innovation or future studies. One reason may be that researchers have an interest in making their methodology as general as possible so that their methods resemble general scientific theories and gain broad recognition.

Another reason may be that the object of design – or innovation – is in a state of transition. Designers are designing many other things than just products, and when they do design products they are often considered as catalysts for changing a bigger context. In the early days of design, in the 1960s, the focus of design was the technologies, functions and production system of a product. Since the 1980s, design has taken on new types of challenges and, consequently, the object of design has almost become all-embracing, expanding into the design of product-service-systems, corporate identity, user experiences, business models, social structures, etc.

In the process of adapting design to the new types of challenges it has become necessary to put the earlier, substantive knowledge away and define a perspective on reality which suits modern challenges. However, as long as the nature of modern challenges remains fuzzy the general design methodology cannot be given a concrete, substantive point of reference. In consequence the design community focuses on non-substantive, operative knowledge and avoids the more controversial discussions about the substance of design. This may explain why much methodological research in the field of design, innovation, business and foresight consists of generalist processes which almost suit any cognitive task. The disadvantage is that they offer very little practical advice on how deal with a concrete assignment. For novices with no previous experience the general theory may add some structure to the project work, but it is of no use for the ambitious professional.

Consequence
In some cases the general process is accompanied by the development of 'toolboxes' containing a selection of more specific methods, techniques and tools which are mapped to the different stages of the general process. These toolboxes are composed through studies of best practice, or common sense, and eventually tested in a few experimental projects. However, there is no reflection on the limitations of the toolbox or the reasons for its effectiveness. Rather, it seems to be reasoned, that if the overall process is more or less universal, the toolbox will also be applicable in any context. This supposition is seen across design, innovation, business and foresight studies, where there exist several proposals for general processes and tool-

boxes which lack reflection on the limitations and proper application of the individual elements.

That lack of reflection comes at a high price. It hampers the proper development of academic knowledge because it is not possible to assess or improve upon a proposed methodology when the context for which it is intended and the reasons for its effectiveness are unknown. For the practitioners the situation creates doubt and frustration, because the methodology does not provide any guidance with respect to when and where to apply one process or tool over another.

Theory, ontology and pragmatism

Across different research disciplines the problem is beginning to be recognized and proposals for research to remedy the situation are being made. Some researchers state that for methodology to progress further it is essential to support the generic processes with reflections on their content and context (Visser et al. 2005; Burmeister 2006). In other words, processes depend on content, and content depends on context.

The Information System (IS) researcher Robert Johnston (2001) suggests that *"rather than borrowing theories ready-made from alien disciplines, we should investigate their meta-theoretical commitments and apply these directly to IS problems."*, and within business studies, "A Multiple Perspective Approach" has already been outlined (Jenkins et al. 2007). The pioneers in meta-theoretical thinking come from different fields of applied research which nevertheless share the same ambition to address modern complex challenges while considering the underlying paradigms and nature of the content.

Atheoretical attitude

The suggestion that the ontological perspective is key to improving the innovation map may be controversial among practitioners and researchers. In particular, design researchers and practitioners are not easily convinced that methodological issues are rooted in theory. They say that many of the seemingly irreconcilable issues that exist at the theoretical level do not affect how problems are solved at the methodological level. It is therefore accepted by design teams to import methods and tools from diverse theoretical disciplines and apply them without further reflection on the context. It may even be claimed that theoretical reflection is not only useless, but conflicts with practice, because theory expresses fundamentalist views which limit the ability to capture the essence of real-life problems.

Nevertheless, the same design researchers and practitioners praise multi-disciplinary teams' abilities to solve complex problems quickly and propose toolboxes or method card games which more or less randomly suggest new perspectives with the purpose of being more effective. Individual disciplines and methods often employ different ontological perspectives as well, indicating that they also believe that modern challenges are best solved by multiple perspectives. The key difference, however, is whether the disciplines and methods should be selected on the basis of theoretically inspired reflection about the context, or whether the method should be allowed to show its own worth no matter the context.

The twilight zone

This study has explored the no man's land between these contrasting views on the value of theory. The study takes the position that while theoretical reflections can be taken too far – and some theoretical issues may not have any implication for methodology – on the other hand, theoretical reflections

have big potential to illuminate the limitations and opportunities inherent in methodology. The objective is therefore to identify the theoretical concepts that have a significant effect on the qualities of the innovation map, rather than to reject theory entirely . It is herein assumed that conceptual insights into the relationship between theory and method can help determine when and where to use a certain method and thus form a basis for the construction of an effective methodological framework.

The researcher has been careful not to take any preliminary stance, but given the requirement of making an easy-to-use framework, the study started by exploring the potential of simple concepts, tools and techniques, and only gradually ventured into deeper theoretical reflections when other approaches failed to produce satisfactory results.

16.2 REDEFINING INNOVATION

Designerly ways of working

In the first part of the thesis, the professional context of vision projects was thoroughly analysed and defined, so that the research could take place within a stable frame of reference. An important requirement has been that the new approach should fit this frame, so in the following we will look at how well that was achieved and, later, how it redefines the professional context.

Designers already have a set of skills needed for the practice-oriented approach. With their emphatic understanding of people and their powers of observation, they can get under the surface of the practical and material context of the everyday and dig into the tacit and unconscious layers of action that characterize practices. They are also used to juggling many different techniques and tools in a project, as well as sampling different bits of information into meaningful compositions, while working in multi-disciplinary teams.

Indeed design thinking is a premise for the multi-perspective and practice-oriented approach, but the approach also makes additional demands which are not always within the capacity of designers.

Firstly, the shift from designing products to designing practices implies that the object of design can encompass a whole constellation of products, services, advertisement, learning material, etc. It follows that the innovation team should have insight, drawing on advertising and educational know-how, into how people's mental images and skills are transformed. Furthermore, practice is integrated with domains such as socio-technical systems and product-service systems which are not a standard components of a designer's education.

Secondly, the deep analysis of different domains and their interpretation may be too advanced for designers. Popular media do not provide the type of contextualized and constructive knowledge that is needed. Of course, there may be an occasional lucky coincidence where a research report has been published on a particular subject which concerns a given vision project, but in general, innovation teams have to develop the content and insights from scratch. That requires investigative work into historical material and local contexts which may be more the home ground of journalists and historians than designers.

Considering all these additional requirements of a practice-oriented approach it may be necessary to expand the multi-disciplinary scope of the vision project beyond the three commonly recommended disciplines:

designers, engineers and ethnologists (Kelley 1999). In relation to envisioning everyday practices a range of additional disciplines may be needed to support the multi-perspective constructivist approach:

- **Anthropologists**
  Who can explore the co-evolution of social and material aspects.
- **Historians**
  Who can make sense of the changes over time.
- **Journalists**
  Who may find popular contemporary and historical information.
- **Market analysts**
  Who know how markets change over time.
- **Opinion gurus**
  Such as artists and politicians who have strong, value-based ideas.

Innovation management
The practice-oriented approach also has wide implications for the management of vision projects. Not only must the managers pragmatically conduct the integration of the different disciplines, they must also understand the ontological aspects of the methodology in order to purposefully negotiate constructive and rational perspectives. Traditional design education does not train students in shifting between different perspectives and it is not an easy competence to acquire. Sociologists may be better trained for understanding the ontological perspectives, but may, on the other hand, lack the all-important solution-oriented and pragmatic attitude of design thinking. With no one discipline as the obvious candidate for managing vision projects, we may note that if designers want to manage vision projects, then they have to understand the methods, tools and techniques from an ontological perspective. Some designers may dislike this way of thinking because of an anti-theoretical prejudice, but as a consequence they will be forced to take a back-seat in the management of vision projects.

It is naturally also an advantage if the individual team members understand the conceptual foundation of a methodology and how to apply it in a concrete context in a designerly way. However, given the abstract concepts it may be more suitable to perform a rushed pre-project that will help the team intuitively understand the approach and the purpose of the individual perspectives.

New object of design

The intention all along has been to change everyday activities by envisioning new solutions or radical innovation opportunities. The practice-oriented approach gives a deeper insight into all the factors which, together with concrete solutions, make up everyday activities and therefore have to be taken into account in the development of new solutions.

For traditional product designers the practice-oriented approach implies a fundamental change of perspective. The product is only a small part of the actors and elements that take part in the performance of a practice, so new domains are introduced in the analysis. Similarly, the synthesis of new solutions becomes more encompassing and opens up fornew types of solutions.

Transforming practices
Practice theory is not just relevant to designers. Introducing a new practice to the market requires an orchestrated effort across an entire company and eventual involves external stakeholders. Marketing departments must con-

vey new understandings to users and new competencies must be taught, either by sales people or through manuals. Advertisements, brochures and in-store-videos are also tools for conveying understandings and building the skills necessary for enrolling future practitioners. In short, the practice-oriented approach brings the functions of a company into one coordinated entity that works towards a single unified goal.

Radical innovation
Any discussion of the degree of innovation inevitably ends up with a discussion of what innovation is. In this research project the unit of innovation is everyday activities. Compared to product- or user-oriented innovation, it is a radical type of innovation, because the activity is the context surrounding products and users and is normally taken for granted. It is therefore out-of-the-box innovation, as seen from within those two innovation paradigms.

In business studies radical innovation is defined as the creation of new markets and the creation of value to businesses (Abernathy 1985). Radical innovation in activities is evaluated on basis of an analysis of the added value to people, business and society. The creation of a new market is not an indispensable requirement.

Organisational networks and alliances

Few organizations have the resources to explore radical innovation opportunities and the practice-oriented approach may even increase that load. The skills and disciplines needed for conducting a vision project surpass the capabilities of the ordinary staff and only very few organisations may be able to fund a dedicated department. It is therefore more sensible to engage specialized innovation consultancies which facilitate the process and supply the know-how that is lacking. Consultancies can share costs across a number of projects and clients, while their experts accumulate experience and skills needed to apply the practice-oriented approach efficiently. Another advantage of employing an external consultancy is their ability as outsiders to bridge different cultures in an organisation and create an environment that is open to innovative thinking.

Costs can be further reduced if organisations sponsor vision projects together. It makes good sense for organisations to collaborate because the innovation map is not directed towards a particular company, but presents a broader overview of radical innovation opportunities, which in many cases actually require that several organisations collaborate to bring about the desired change. To gain momentum, it is common to enrol a wider group of stakeholders who share a common interest in the theme of the project. For any theme there may be many potential stakeholders, e.g. 'commuting' is relevant to bicycle, car and train industries from the retail to the production chain. Another solution is to form a business alliance with other companies to share costs and build the momentum necessary to change and support new practices.

16.3 PRACTICAL RELEVANCE

Effect on innovation map

The main objective of the study is to make the innovation map more navigational, so it is important to discuss to which degree that has been obtained. It is believed that the practice-oriented approach produces significant improvements across all three navigational qualities of an innovation map. The study shows that it is possible to capture the nature of everyday activit-

ies and thereby collapse the immediate complexity without sacrificing substantial information.

By exposing the underlying logics the practice-oriented approach provides a high level of insight into the dynamics and change of the manifest reality. These insights increase the transparency of the innovation map, such that the alternatives are not randomly scattered, but are positioned according to the underlying dynamics. The transparent structure makes it possible to estimate the comprehensiveness of the alternatives presented, as well as to gain insight into the 'fluid' change of the innovation map as interventions or new developments take place.

While the trend-based approach explores alternatives by combining elements in all possible hypothetical constellations, the practice-oriented approach reveals the underlying logics which determine how the elements come together in specific configurations. As a result the practice-oriented approach gives a more realistic overview of the possible and desirable alternatives. The overview typically contains fewer alternatives than an open, trend-based approach, because naive and hypothetical occurrences are sorted out. In this way, the quality of 'comprehensiveness' is not a matter of having the most possible alternatives, but of assuring that the alternatives represented cover the underlying structure.

Fitness with project context

Initially, it was imagined that the vision project would be executed by a small team of designers in a “quick n' dirty” way. The team would quickly sample a broad variety of information from easily accessible sources and transform it into a suitable format. With the multi-perspective and constructivist worldview this is no longer possible.

The study shows that if the objective is merely to stimulate the creativity of employees and eventually stumble upon a new innovation, then a short workshop following the scheme of the reductionistic trend-based approach is the most appropriate methodology. However, if you truly want to learn about the full potential of radical innovation opportunities within a give field, it does not suffice simply to extend the trend-based approach. New perspectives are needed to capture the complexity, while the substantive and operative methods must be closely integrated at the theoretical level. Projects may last months and, ideally, there will be a small group of full-time staff to make sure that projects build upon one another and are disseminated throughout the wider organisational structure. Naturally, shorter workshops involving groups of stakeholders may also be conducted, but these should form part of a greater project and build on the basis of the preceding work.

Reliability

The approach is a highly contextual methodology constructed to fit the typical setting of vision projects. If the practice-oriented field of study had not been encountered during the research, it might not have been possible to propose an applicable constructivist alternative to the rational approach. The recommended framework is therefore highly dependent on recent research developments in sociology and socio-technical studies and without these advancements the constructivist approach would not have been applicable in the context of vision projects. When more applicable or effective approaches are developed, based on a constructive approach, they will form part of the methodology. The potential existence of other methodological frameworks, concepts or methods that build on the constructive per-

spective and might possibly be more effective or efficient than the material encountered in this research cannot be precluded. To wit, there are many groups in user-oriented design and social action that are working along the same lines.

Nevertheless, it should be noted that this study has gone to great lengths to identify relevant methodology and used different search techniques to unfold the widest possible overview. It is therefore believed that the practice-oriented approach incorporates the most important dimensions in relation to vision projects and the basic outline of the approach will form a stable core for future developments.

16.4 ACADEMIC CONTRIBUTION

Academic discussions

The description of the larger research context within which this study takes place makes it possible to estimate the relevance and contribution of the study. The research enters right into the no man's land between two opposing positions in applied research, but particularly controversial in design research. The one position claims that theory is the starting point of methodology, while the other claims that theory has nothing to offer, and may even hampers the development of practical methodology. The research shows that in the context of vision projects – and more broadly in sustainable innovation – there are, in particular, two theoretical paradigms which are relevant for the development of an effective methodology: constructive and rational perspectives.

The lines between the two positions are clearly drawn in academic debate, but few studies seek to negotiate the two positions as concretely as this study does. The findings of the study may therefore contribute to a softening of the polarization in applied research and show a way towards further research into a middle ground.

The general insights about how techniques and methods fundamentally propagate different world-views and either empower or obstruct a deeper understanding of reality is considered to transcend the specific research object and be applicable to all applied research which seeks to develop methodology for intervention.

The distinction between constructive, rational, substantive and operative theory is particularly important in projects where an in-depth understanding of the complexity of social reality is important, such as vision projects and, more generally, projects aimed at sustainable innovation. Sustainable innovation is a persistent theme within design, innovation, business and foresight studies, so the research can potentially contribute to these disciplines.

The theoretical concepts may not be the most relevant distinction for other types of projects, but the research nevertheless shows how some theoretical concepts can make a much needed contribution to the construction of an effective methodological framework.

Methodological knowledge

The construction of the approach and framework aims first and foremost to be relevant to practitioners in the context of vision projects. It is therefore highly contextual knowledge with primary relevance for practitioners and researchers in the emerging field of vision projects. However, the concrete formulation of the practice-oriented approach and the integration in the

basic process may have methodological relevance which exceeds the narrow the field of vision projects.

Design, innovation, business and foresight
The modelling of methodology builds on a tradition in design studies to develop structured and practical methods. In the process it integrates methodology from a number of fields. For example, in this study design methods are used as a tool to deepen and extend scenario methodology, which is then used in the context of innovation and business development. The concrete approach and framework of this study may therefore also be relevant for foresight, business and innovation studies – not so much because the study adapts and modifies the individual models and methods from these disciplines, but because it shows how their methodology can be put to use for an important practical purpose by integrating them into a bigger framework. This may inspire new research both within and across the disciplines.

Transformation design
The vision project has a strong component of value-based change, so the approach and framework may also be inspiring for social action projects. These projects are typically consensus-seeking driven but lack the complementary, solution-oriented methodological frameworks capable of analysing the social reality in depth.

Sociology
The study positions sociological research as a central pillar in the ontological foundation and elevates the debate of frameworks within design innovation to the level of social paradigms. Presumably, it could be of interest and inspiration to sociologists to see how their research can be used in applied research for analysing the everyday and – perhaps even more interesting – shaping the future.

However, not all social researchers agree that a pragmatic and structured methodology is appropriate. For example, Winner (1993) states about practical approaches:

> *"It offers clear, step-by-step guidance for doing case studies of technological innovation. One can present this method to graduate students, especially those less imaginative graduate students who need a rigid conceptual framework to get started, and expect them to come up with empirical studies of how particular technologies are 'socially constructed'."(Winner 1993, p.366)*

Admittedly, a rigid and practical conceptual framework may be cutting corners when it comes to some of the subtle nuances of a social science, but given the nature of applied research, and vision projects in particular, it is acceptable and useful.

17 CONCLUSION AND PERSPECTIVES

The principal motivation for this study is the concern that vision projects do not produce a sufficiently navigational innovation map. It is assumed that the methodological framework is the main cause for the unsatisfactory outcomes. Therefore, this study seeks to model an improved framework by integrating existing theory and methodology from related fields of study.

The following two research questions guide the research:

RQ1: What is the issue which causes an unsatisfactory innovation map and which type of methodological approach can most significantly improve the quality of an innovation map?

RQ2: How can a new methodological approach for vision projects be constructed and integrated into an overall framework so that it is applicable within the project context?

A pre-study prepares the ground for the research by describing and defining the professional and academic context of vision projects. The pre-study presents a clear definition of the purpose and desired qualities of the innovation map. It also presents a foundation for understanding what a methodological framework is and presents a basic process, based upon scenario methodology, which acts as a foundation for new methodological approaches.

The study performs four iterative research cycles which gradually build new knowledge about the construction of methodological frameworks for exploring and mapping radical innovation opportunities in the context of vision projects. Each cycle consists of three elements: formulation of an hypothesis, modelling of an approach, and experimentation in a real-like setting.

17.1 FINDINGS

The results of the research are:

1. A conceptual understanding of how different methodological measures affect the navigational qualities of an innovation map.
2. An outline of a methodological approach and its integration into an overall framework for vision projects.

Conceptual understanding

It was found that simple concepts, tools and techniques could remedy certain issues and qualities of the innovation map, but that there was a clear limitation to the positive effect as long as these measures propagate rational perspectives on social reality. For further improvement it was found necessary to reflect upon the fundamental nature, dynamics, and change of everyday activities and how they are propagated in the methodological framework.

Conventional methodological knowledge dictates that theory may be divided into substantive and operative, where the former explains 'what is' and the latter 'what may be'. These two types of knowledge are considered to be independent, so that the definition of the substance and the search for

alternatives, in principle, are not related. However, the study reveals that the two theoretical concepts are related and may subvert or empower one another, depending on the perspective on the dynamics of the subject matter that they propagate.

In consequence, the study suggests that construction of methodology should, first and foremost, be based on an understanding of the ontological perspectives. Herein it is found that it is particularly relevant to differentiate between rational and constructive perspectives in the context of vision projects. In general, one may say that the constructive perspective offers a deeper insight into the nature of social reality, while the rational perspective does not require as many resources, and contains simple guidelines for envisioning change.

The making of a methodology is therefore a negotiation of the two perspectives conditioned by availability of applicable constructive theory, as well as the resources available for a given project. The pragmatic approach is therefore to supplement with rational elements where there is no applicable constructive theory.

In addition to the discussion of perspectives, it was found to be important to reflect upon the relationship between everyday activities and related domains. The research shows that everyday activities co-evolve with other domains, but they are not determined by macro-factors, as suggested by existing methodology. Domains form networks, and depending on the focal domain, one can identify domains that are closely related. The scope of domains should, as a minimum, connect the object of design with the domain of intended effect, but may unfold further from these core domains depending on the defined scope of the individual project.

Each of these domains is subject to its respective perspective and dynamic. The exploration of the change of everyday activities is therefore not only about understanding the nature of everyday activities, but understanding the dynamics within and across all related domains.

Every domain may be subject to different perspectives which may capture the nature of the domain in-depth and require resources at different levels. These perspectives can then be negotiated for the construction of a methodological framework, depending on the importance of the individual domain, the availability of applicable methods, and the resources available.

Research question 1
The answer to the first research question is:

a) Navigational qualities are most significantly improved by developing an ontological foundation which reveals profound insights about the nature, dynamics and change of everyday activities.

b) A constructivist ontological perspective on a particular domain allows for a deeper understanding, but also requires more resources than the dominant rational ontological perspective. In the context of vision projects the use of either constructivist or rational perspectives therefore depends on the availability of applicable constructivist approaches.

c) Everyday activities co-evolve with other domains of investigation, necessitating a multi-domain approach.

Approach and framework

In this study, considerable efforts have been dedicated to the search for effective theory and methodology applicable to the context of vision projects. Most importantly, the study identified a body of knowledge, under the

name “Practice-Oriented Product Design,” which contains a practical and coherent foundation of constructive perspectives which can account for the complex interplay within and across everyday activities and related domains.

The practice-oriented approach is a big step forward in bringing constructive perspectives together in a forward-looking and solution-oriented methodological approach applicable to the context of vision projects. It is therefore possible to shift the balance from a primarily rational foundation for a methodology to one that is mainly constructive ontological, thereby significantly increasing the qualities of the innovation map.

All in all, the practice-oriented approach was found to be a valid alternative candidate to the rational, trend-based approach. First and foremost the concepts and models of practice theory provide a deeper insight into the dynamics and change of everyday activities, and in a way that is practically applicable within the context of vision projects. Secondly, it is found that the concept of practices is a unit of analysis that can bring together a number of domains and new perspectives into a coherent whole. Practices are therefore the central nexus for the multi-domain approach that has been constructed, and it is therefore called a “practice-oriented” approach.

The research outlines a modified version of the practice-oriented approach which is tailor-suited for the purpose and scope of vision projects. In the fourth research cycle it was shown that the approach is compatible with the basic process for vision projects, but has a pervasive effect on the domains and perspectives investigated within this process. The implications are described at a general level, but are also exemplified in the description of the fourth and final experiment.

It is found that the practice-oriented approach does require more resources and special skills. Yet given the potential role of vision projects as a central tool for the management and mission-finding in an organisation, the extra resources will be well justified. Alternatively, it is possible to scale down the depth of the constructive analysis and still benefit considerably within a modest budget. As mentioned before, the modelling of a concrete framework is not a question of either-or, but a negotiation of the two perspectives in relation to the allocated resources and existence of applicable methodology.

Research question 2
The answer to the second research question is:

a) Recent research has developed a new 'practice-oriented' body of theory that makes it feasible to incorporate constructivist perspectives into the methodology for vision projects.

b) The practice-oriented approach captures competently the change of everyday activities and can function as a nexus for integrating other perspectives.

Relevance and contribution

The proposed practice-oriented approach and framework are considered to make a significant improvement to the navigational qualities of an innovation map. It makes it possible to understand the change and continuity of everyday activities at a much deeper level than the current, trend-based approach does. This has a profound effect on the ability to identify essential structures and patterns, thus increasing an innovation map's transparency and fluidity. These insights make it possible to assess the comprehensive-

ness of an innovation map, so that a truly representative overview may be created.

The approach does require the presence of more advanced skills and resources than many organisations can mobilize, but the prospect of valuable insights, the option to share costs among organisations, and the flexibility to scale down, makes it a relevant proposal for practitioners.

The findings are also a significant contribution to academic methodology. The ontological foundation informs the construction of a methodological framework by providing insight into the negotiation of perspectives and the integration of domains which have proven fundamental to the generation of a navigational innovation map. Hereby, it provides a foundation for assessing the potential and proper application of methods, techniques and tools with relevancy across all disciplines of intervention-oriented applied research.

The insights about theoretical abstraction enter in the liminal zone between opposing positions among academics about the relevance of theory in relation to the construction of methodology. The research adds to this discussion with concrete evidence that, in the context of vision projects, theoretical understandings can have a direct impact on the construction of methodology and the quality of the innovation map. However, the study also illustrates that some theoretical concepts are irrelevant and have no significant influence on the innovation map.

The idea that the change of reality should be analysed by looking at a variety of domains is not new and is essentially a logical consequence of a critical realist paradigm., However the call for multi-domain analysis is rarely followed by concrete reflections and recommendations, so this research also adds substance to the field of academic discussion.

The intention with the approach and framework is to contribute to the development of a dedicated field of study which focuses on vision projects. Because vision projects take place in the intersection between design, innovation, business, and foresight, it may more broadly be considered a contribution to these fields of study. The proposed approach is also a contribution to the mainly sociological field of practice-oriented product design, because it re-frames and elaborates this body of knowledge.

Finally, the results of the pre-study are necessary prerequisites to being able to conduct the research, but they also contribute more generally to the establishment of the field of vision projects and the movement towards using design thinking for facing modern challenges.

17.2 RESEARCH DESIGN

The ambition to make a relevant, concrete, and significant contribution to an emerging field was a challenging starting point for the research. It would have been reasonable and feasible to divide the project into at least two separate studies. For example, the pre-study investigation of the phenomenon and professional context of vision projects could have been conducted in an earlier research project, which would have eliminated some of the uncertainty surrounding the definition of the research assignment, thus diminishing the collective workload.

The overall research approach of iterative learning cycles proved to be both practical and efficient. The main phases of reflection, modelling and experimenting integrated naturally into one another, but there were also great challenges involved. In particular, it was challenging that the main issues were deliberately left open for interpretation, so that for every research

cycle the results first had to be thoroughly analysed and thereafter a new, matching, methodological approach had to be developed, based upon an open-ended search for potential methodological input. The challenges were obvious from the beginning of the research, so the initial plan was to define the main issue within the first few research cycles. However, the ambition to make a truly significant contribution insured that the issue kept evolving. The consequence was that the findings of the research are believed to make a significant contribution at the conceptual level, but do not necessarily describe the framework at the level of detail that was expected.

The high demands of the research approach made the success of the research project highly dependent on the researcher's skills. It was therefore critical for the success of the study that the researcher had prior work experience with analysing conceptual innovative ideas, and advanced information technology skills to search for relevant methodological input.

While it is tempting to suggest that the research should have been better defined at the outset, it would not have been possible to generate the same level of contribution with a narrow assignment. At the end of the day, the premises of this type of research is not only to describe current methodology, but also to endeavour to fundamentally change the methodology and explore with an open mind the potential of existing methodology and theory in a concrete professional context. In this way, the research approach exemplifies how a study, guided by the ambition to produce a concrete and significant improvement of the outcome of a vision project, may gradually explore the methodological and theoretical issues involved and give insights into the potential for improvements at each level.

Given that this type of research is crucial to meeting modern challenges, which will most likely increase in coming years, it should be mentioned that the research foundation for intervention-oriented applied research is not sufficiently developed to guide researchers. At present, researchers in this field have to piece together a research approach with inspiration from such diverse fields as engineering and sociology which do not fully grasp the issues related to this type of research.

17.3 FURTHER RESEARCH

Ready-to-use framework

It is believed that in order to establish and stimulate the practice and research in the field of vision projects, it is crucial to provide ready-to-use frameworks and examples of results. In this study much effort has been dedicated to the development of the conceptual understanding and the theoretical approach. As a consequence it was not possible also to make detailed studies of all the methods, techniques and tools that come together in the execution of a project. The final experiment exemplifies how to construct a viable framework on the basis of the practice-oriented approach, but the experiment does not justify making detailed recommendations. More elaborate studies are needed in order to present a ready-to-use framework. Such a study may, in particular, concern:

- How to negotiate and prioritize the unfolding of domains and the prioritisation of perspectives in relation to specific themes.
- The search for existing methods, techniques and tools in the intersection between design and sociology, that may further operationalize the constructive perspective within key domains.
- Assembly of a toolbox of methods, techniques and tools that support a variety of perspectives and domains.

Values and solutions
The research has focused on the analytical interpretation rather than the value-laden visioning. This is primarily caused by the lack of time, but also because the subject borders on philosophy and existential reflections, which are beyond the reasonable limits of the research. Nevertheless, it is important to understand how different solutions propagate certain values, as well as the principles for how values can be given concrete form.

Critical perspective
It could also be interesting to study the practice-oriented approach from a critical perspective. Ken Wilber (1993) has presented a mapping of the collective human knowledge which could be a starting point for critical analysis of the realms that are being unfolded by the approach. Surely there are knowledge domains that can further deepen our understanding of practices. Neuroscience is, for example, a field in which great advances have been made in recent years and may give new insight into how the interplay of cognitive and bodily capabilities influences everyday activities (Damasio 1995).

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This study presents a methodological framework for organisations to explore and map radical innovation opportunities. It focuses especially on innovation opportunities related to everyday activities, which empower organisations to pro-actively confront modern challenges for the benefit of people, business and society. The framework is developed through a series of four research cycles which model and experiment with different methodological approaches, based on analysis of a wide field of existing theory and methodology. The study finds that a new body of knowledge, developed around practice theory from the field of sociology, can effectively uncover the fundamental conditions which shape everyday activities and, thereby, significantly improve the quality of innovation maps.

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